The Journal of Nervous and Mental Disease

Vol. 123, No. 4 APRIL 1956 Serial No. 892

CONTENTS

Prefrontal Procaine Injection: A Study of Fourteen Patients with One Year Follow-up. J. M. Myers, Jr., P. Therman, C. S. Drayer, M. M. Pearson, F. C. Grant, L. H. Smith and F. E. Nulsen. 311

The Possibility of Psychosomatic Involvement of the Central Nervous System in Schizophrenia. S. Arieti 324

Additional Contributions to the Sensorimotor Induction Syndrome in Unilateral Disequilibrium with Special Reference to the Effect of Colors. L. Halpern 334

Pleasure: Preliminary Report of an Investigation. B. Buchenholz 351

Peripheral Sensory Inhibition of Pain with a Parietal Lobe Lesion. S. E. Trent 356

Phantom Limb Syndrome Occurring During Spinal Anesthesia. J. E. Miles 365

Cross-Cultural Psychotherapy. M. M. Bishop and G. Winokur 369

Parenchymatous Cortical Cerebellar Atrophy. P. Chodoff, T. Auth, and H. Toupin 376

Investigations on the Glyoxylic Acid Reactions on Urines from Schizophrenics and Other Psychotic Patients. L. M. Riegelhaupt 383

Three Cases of Self-Castration. S. E. Cleveland 386

Reserpine in the Treatment of Patients with Chronic Mental Disease. L. Koltonow 392

Individual Reactions of Alcoholic and Neurotic Patients to Music. A. Zanker and M. M. Glatt 395

The Influence of Music on Groups of Alcoholic and Neurotic Patients in a Mental Hospital. A. Zanker and M. M. Glatt 403

Society Proceedings

New York Neurological Society and New York Academy of Medicine, Section on Neurology and Psychiatry—Joint Meeting, March 13, 1956 406

Massachusetts Society for Research in Psychiatry. Meeting, March 9, 1956 408

Book Notes and Reviews 410

Notes and News 413

The International Journal of Social Psychiatry

The First Quarterly Journal in this Field

Vol. II Autumn 1956

This issue published articles by:—

Ornulv Odegard.—NORWAY.

The Incidence of Psychoses in Various Occupations.

I. H. Abdelhalim.—EGYPT.

Factors Related to the Attitudes of Adults towards Relations Between the Sexes in a Specific Culture.

Patricia Grygior.—GREAT BRITAIN.

The Personality of Student Nurses.

Toby B. Bieber.—U.S.A.

The Emphasis on the Individual in a Psychoanalytic Group Therapy.

O. W. Fonseca & J. W. Vineberg.—CANADA.

Emergent Social Structure Among Short-Term Psychiatric Patients.

P. Sivadon.—FRANCE.

Adaption Factors in the Work of Mental Patients.

Reports and Reviews.

Annual Subscription. (Four Issues) £2 or $8 for Hospitals, Libraries, Firms, Government Offices, etc., £1.5/- or $5 for individual subscribers who certify that the Journal is for their personal use.

All enquiries to be addressed to:—

The Secretary
The International Journal of Social Psychiatry,
9, Fellows Road, London, N.W.3, England.

The Journal of Nervous and Mental Disease

Vol. 123, No. 4 APRIL 1956 Serial No. 892

PREFRONTAL PROCAINE INJECTION: A STUDY OF FOURTEEN PATIENTS WITH ONE YEAR FOLLOW-UP[1]

J. MARTIN MYERS, JR., M.D., PER-OLOF THERMAN, M.D., CALVIN S. DRAYER, M.D., MANUEL M. PEARSON, M.D., FRANCIS C. GRANT, M.D., LAUREN H. SMITH, M.D., (PHILADELPHIA)[2] AND FRANK E. NULSEN, M.D. (CLEVELAND)

Numerous methods of permanently or temporarily interrupting the function of the frontal lobe of the brain have been devised for the treatment of patients suffering from intractable pain or severe psychiatric reactions. Moniz (7) in his original report published in 1936 described the injection of small amounts of alcohol into the frontal white matter. Since then procaine solutions have been the most frequently used substance for injection. Soulairac and Barbizett (12) tested the effects of procaine injected into the brains of rats. Putnam (10) and Van Wagenen and Lin (13) have reported its use as a means of estimating in advance the effect of a surgical prefrontal lobotomy. Mandl (6), Buccaille (3) and Nulsen and Grant (9) have used procaine brain injections for the treatment of intractable pain. As a method of treating patients with psychotic disorders, prefrontal pricaine injections were reported in 1950 by Lindsay (5) of New Zealand, Hoff (4) of Vienna, and Adams (1) of San Francisco.

An effective psychotherapeutic relationship with the patient who has developed a severe schizophrenic or obsessive-compulsive reaction is still difficult for the psychiatrist to achieve, even if he utilizes all his skills and patience. The treatment of patients with intractable pain by injection of procaine into the frontal white matter has shown that the lobotomy-like effect persists for some weeks, but then disappears. It therefore seemed possible that this "temporary lobotomy" might be useful in an over-all psychotherapeutic plan. It was thought that those patients who were relatively inaccessible and lacking in response to psychotherapy might be temporarily relieved of their inaccessibility and severe psychiatric symptoms. During this period the psychotherapist might be able to establish an interpersonal relationship possessing significance and meaning for the patient. This relationship might be maintained until the function of the frontal lobe was reintegrated with the central nervous system; and a kind of personality reorganization be achieved through the utilization of an uncovering type of psychotherapy that could not be used when the central nervous system was not functioning as an intact unit.

Another important purpose of the project was to pursue the search for a reversible, nondestructive type of interruption of the thalamofrontal radiations which might produce the established benefits of a lobotomy without the deficit variously referred to as "bleaching of the affect", "personality downgrading", "frontal lobe syndrome", etc.

It was decided to select for procaine brain injection a few cases who might have been considered for a classical operation. The criteria adopted were predominantly those for a prefrontal lobotomy (11), that is, patients with anxiety, tension, fear, or self-concern who were chronically and severely incapacitated; who

[1] This project was supported by grants from the Catherwood Foundation and Kirkbride Fund for Research in Psychiatry.

[2] From the Pennsylvania Hospital, Department for Mental and Nervous Diseases, and the Hall Mercer Hospital, Pennsylvania Hospital Division.

had failed to gain or maintain a good response to adequate treatment including the somatic, such as electroconvulsive therapy and insulin.

During 1953, 14 hospitalized patients previously studied were injected with procaine. The diagnostic classification of these patients was: 8—schizophrenic reaction, paranoid type; 2—schizophrenic reaction, catatonic type; 1—schizophrenic reaction, chronic undifferentiated type; 2—obsessive-compulsive reaction; and 1—manic-depressive reaction, depressed type. Twelve of the patients had been ill for more than one year, and only one had had no previous somatic therapy.

The emphasis of this study was on the clinical aspects. The patients were seen daily if possible, before and after procaine injection, by a psychiatrist in an attempt to establish a meaningful therapeutic relationship while observing the patients' interpersonal reactions. A modified Sands-Malamud Rating Scale was used as an adjunct to the clinical observations.

Technique of Brain Injection

(By Frank E. Nulsen, M.D.)

The technique utilized was arrived at empirically as a procedure which would produce sufficient frontal lobe dysfunction to cause relief of pain in the patient with terminal carcinoma. At the same time, certain safeguards to avoid complications are stressed.

One centimeter trephines were made at the level of the coronal suture on each side 4–5 cm. from the midline under local anesthesia plus intravenous pentothal when necessary in the disturbed patient. The dura was opened, and surface vessels were thoroughly coagulated with the electrosurgical unit. The first injection was usually reserved for a separate stage so that it might be accomplished in a conscious patient who could be carefully observed with a minimum of interference by surgical drapes. Prior to each injection treatment, prophylactic use was made of anticonvulsants and antibiotics, and the patient was given nothing orally for six hours before treatment, with no premedication except for occasional small amounts of amytal in disturbed and resistive patients. Oxygen was kept available during the course of injection. Before each increment of injection the patient was carefully evaluated as to size of pupils, degree of sweating, speech content, and responses to questioning in addition to recording of pulse, respiration, and blood pressure.

No. 20-gauge LP needles were introduced through the intact skin and skull openings toward the medial portion of the sphenoid ridge. The lateral canthus of the ipsilateral eye and the trephine determined the coronal plane, while the ipsilateral pupil and the trephines determine the sagittal plane of the needle. With each 1-cm. advance of the needle point, the stylette was removed and the needle inspected for any drops of ventricular fluid. If this did occur, the needle was withdrawn and directed more anteriorly. Ordinarily the needle would be arrested at the floor of the skull at a measured distance of 8.6 to 9.0 cm. from the skin surface. Failure to encounter resistance by a depth of 9.0 cm. called for more anterior placement of the needle. Having encountered the floor of the skull, each needle was withdrawn 1.5 cm. from the sphenoid ridge for initial injection. Sterile unbuffered 1 per cent procaine solution freshly prepared was utilized for injection. (In two patients showing hyperthermia with minimal behavioral changes, deteriorated solution which had been stored too long was possibly responsible.) Initially 5 cc. of procaine were injected slowly and with a minimum of force so as to produce as little mechanical damage as possible. The needle was then promptly sealed with its stylette to prevent backflow of a portion of the injected solution. Three to four successive injections on each side to a total of 15 to 20 cc. were gradually accomplished with withdrawal of each needle 1.0 to 1.5 cm. further for each injection. An additional 5 cc. were injected only after an interval of at least five minutes and only if the autonomic changes and alteration in sensorium, which reach their peak within three minutes of injection, had considerably abated. Whenever such changes, especially any slowing of respiration or depression of consciousness, persisted, injection was discontinued. Occasionally injection was stopped short of the usual volume when marked improvement in the patient's behavior occurred. Caution not to superimpose additional physiologic alteration during the development or maintenance of striking autonomic change is the most important consideration for safety in the procedure. Similar

procedures were carried out in a total of two to four sessions and at intervals of at least 48 hours in all of these patients.

Although clinically-detectable intracerebral bleeding did not occur in any of these patients, it remains a potential hazard. When these injections are performed, as was the case here, in a psychiatric facility not a part of a general hospital, they should be undertaken only when careful post-operative observation is possible and when there exist nearby full neurosurgical facilities to deal with the remote, but critical possibility, of cerebral hemorrhage requiring surgical intervention for its evacuation and control.

In three of six patients autopsied elsewhere thalamic and cortical nuclear stains failed to show significant cellular degeneration. It would appear that small confined hemorrhages can add anatomical damage to what was considered a pure procaine effect. However, the evidences of frontal lobe dysfunction seen in both pain problem and psychotic patients would not have been produced by confined surgical lesions to the extent of the anatomical destruction produced by these observed hemorrhages. Furthermore, in the pain problem, similar autonomic disturbance, transient EEG change and behavioral changes were not produced by equivalent amounts of saline. As in electroshock therapy, there appears to be a physiologic effect upon frontal lobe function quite out of proportion to the anatomical damage that occurs.

Report of Cases

Case I: (U. B.) A 23-year-old deaf-mute girl admitted to the Pennsylvania Hospital on September 12, 1952. In 1947 hospitalized for an autistic love affair with delusions of marriage and pregnancy. Treated with insulin and electroshock with much improvement. Paranoid symptoms recurred in 1951 and continued in a cyclic psychotic pattern, lasting about 5 to 7 days every 35–40 days. No correlation with menstrual cycle. Received more electroshock with very temporary improvement.

The patient was psychotic on admission, negativistic, suspicious and delusional; but symptoms cleared within 7 days. The cyclic pattern continued without interruption. On January 20, 1953, at onset of a psychotic period, trephines were done, followed three days later by the injection of 9 cc. of 1 per cent procaine bilaterally. There was slight improvement after each of these procedures, and on January 26, 1953, 7 cc. more were bilaterally injected. Two days later she was non-psychotic. On February 23, as she seemed to be withdrawing, she again received procaine injections (9 cc. each side). (The reason for the small volume of solution injected on each occasion was that striking dilatation and sweating along with relaxation of tension and confusion occurred in response to these small amounts. As an example, with one 5-cc. increment, pupils dilated widely, blood pressure rose to 170/120, and respiration became sufficiently shallow to cause cyanosis. Three minutes later these objective changes began to subside, and the patient began talking in animated fashion with reference to ideas of persecution, having been previously uncommunicative.) She improved without reaching the depths of her previous psychotic episodes, only to begin a relapse 38 days later. On April 6, 1953, 15 cc. on each side were injected with immediate and sustained improvement.

She became cheerful, outgoing, and social. This continued for 87 days with subsequent hospitalization (through two expected cycles). She was discharged on July 3, 1953. Analytic type psychotherapy was not possible with this patient. Her score on the rating scale fell from a high of 33 prior to injection to 0 afterward.

She has been free of psychosis and is living independently in the city. She wrote a letter saying how much easier the procaine injections were than the electroshock treatments, that the latter were terrifying to her and not beneficial.

Case II: (W. R.)[3] A 52-year-old man was brought to the hospital by his wife on February 24, 1953, because of a severe exacerbation of an obsessive-compulsive reaction that had had its onset at age 19. He had had for two months obsessive fears of infecting other people and injuring others in his automobile driving. For several days he had been so indecisive and preoccupied that he was unable to dress or eat without physical aid and constant reassurance.

In August, 1951, a similar exacerbation had

[3] This case was previously reported. See reference (8).

TABLE 1.—CLINICAL SUMMARY OF CASES

Patient	Diagnosis	Duration of Illness	Previous Somatic Therapy		Procaine Injection Response	Subsequent Somatic Therapy	Follow-up Results	Results
			Type	Immediate response				
I U. B.	Schiz., Para., Cyclic	1½ yr. (5 yr.)	Insulin ECT	Good	Much improved	0	Recovered Living independently	2nd, 3rd, 4th injection separated by over one month
II W. R.	Obs.-Comp.	3 mo. (33 yr.)	ECT	Good	Much improved			Relapsed in six months
					Much improved		Much improved At home	15 months of freedom from incapacitating symptoms so far—longest in five years
III M. M.	Schiz., Cat.	3 yr. (4 yr.)	Insulin & ECT	Slight	Gradual slight improvement	0	Unimproved In hospital	Relapsed shortly after leaving the hospital
IV L. N.	Schiz., Para.	2 yr. (10 yr.)	Insulin & ECT ECT	Slight	Unimproved	ECT	Unimproved In hospital	
V H. R.	Schiz., Para.	3 yr. (7 yr.)	Insulin & ECT ECT CO_2	Slight	Unimproved	ECT	Unimproved In hospital	
VI F. E.	Schiz., Para.	10 wk. (10 wk.)			Unimproved	ECT	Recovered At home	Recovery followed ECT
VII E. C.	Schiz., Para.	7 mo. (3 yr.)	ECT Insulin & ECT	Slight	Slightly improved	0	Much improved At home	
VIII M. U.	Schiz., Cat.	1 mo. (10 yr.)	Insulin & ECT	Good	Slightly improved			Relapsed in four months
					Slightly improved	Chlorpromazine	Much improved At home	Chlorpromazine very effective
IX D. S.	Schiz., Para.	2 yr. (6 yr.)	Insulin	Slight	Unimproved	ECT Chlorpromazine	Unimproved In hospital	Seems to be very slightly improved
X W. M.	Schiz., Para.	10 yr. (15 yr.)	Insulin & ECT	Slight	Very slight improvement	0	Unimproved In hospital	
XI A. E.	Schiz., Para.	2 yr. (10 yr.)	ECT	Slight	Very slight improvement	Insulin & ECT Chlorpromazine	Improved At home working	Improved with combined therapy; chlorpromazine showed no effect
XII B. D.	Obs.-Comp.	8 yr. (8 yr.)	Insulin & ECT	None	Worse	0	Very slight improvement At home	
XIII F. M.	Schiz., Chr., Undiff.	12 yr. (12 yr.)	Insulin	None	Very slight improvement	0	Unimproved Living out of hospital	
XIV H. B.	Manic-depressive, Dep.	5 mo. (27 yr.)	ECT	Slight	Died			

Duration of Illness: Time given refers to time since last remission. Figure in parentheses refers to total illness.

been treated with 10 electroshock treatments with much improvement. He relapsed in June, 1952, received 14 convulsions, and showed signs of relapsing four months later.

In this hospital he was treated with psychotherapy, but his condition got worse. He became more withdrawn, and his phobias became delusions of "getting something on" the male nurses which might harm them or on the female nurses which might impregnate them. He lost 13 pounds of weight.

On March 24, 1953, bilateral frontal trephinations were done with no clinical change. Two days later 20 cc. of 1 per cent procaine were injected into the right frontal lobe and 25 cc. into the left. Almost immediately a marked clinical change was noted with little indecisiveness remaining. On April 8, 10 cc. additionally were injected into each frontal lobe because he appeared to be relapsing. (At the time of each injection there was definite but less autonomic response with each 5 cc. increment than in Case I, but a marked relaxation of tension was noted through the course of each procedure.) His improvement was maintained. He denied that he had been ill, and efforts at dynamic psychotherapy were unsuccessful. On return home he resumed his usual activities; his wife felt that he was better than she had known him. Psychotherapy was continued but was accepted by him only on a supportive, manipulative basis.

In September, 1953, he showed signs of increasing tension, spoke of his phobias, and showed blocking in his activities so that he was returned to the hospital on October 5, 1953, for another injection. He was far less incapacitated than the previous February. On October 7, 1953, injection of 19 cc. of procaine into the right frontal lobe was followed by a grand mal seizure. He showed clinical improvement in that he showed no tension nor mannerisms and he denied any phobias. He was discharged on October 16 to return home where he has been since. For several months he passively continued to see the psychiatrist at regular intervals. He then broke off as he could see no point in it. He has been carrying on his pattern of activities at home without evidence of increasing severity of symptoms for 15 months since his last discharge.

The rating scale high of 52 prior to first injection dropped to 5–10 the month after injection, declined to 1–3 in May to August, started to rise in September, reaching 28 on October 6. It then fell to 5–7.

Case III. (M. M.) A 22-year-old girl was transferred on June 18, 1952, to this hospital with a history of withdrawal and indifference for several years. More recently she had shown impulsive behavior in autistic love affairs. She refused to talk to the doctors and rebuffed any attention from the nurses. A full course of combined therapy (58 insulin and 19 electroconvulsive) effected only minimal improvement in that she could live off the disturbed floor. Efforts at psychotherapy were without avial, and six months later (April, 1953) two procaine injections were done. She received a total of 15 cc. on the first and 25 cc. on the second. During each injection there was practically no autonomic change noted and virtually no change in behavior. There were no complications. The only change was slight decrease in her silliness and hostile behavior. About a month later a new nurse was able to develop a positive relationship with her, and she was able to leave the closed ward in yet another month, and the hospital the next month. She seemed to make a moderately good social adjustment for about six months, when she was returned to the hospital. She remained withdrawn, silly, impulsive, and bizarre; and she was transferred elsewhere in November, 1948.

The rating scale score was not significantly different after injection (17–19) than before (19–24). After the special nurse started working with her, it declined to 12.

Case IV. (L. N.) This ex-serviceman was admitted in October, 1949, at the age of 27 because of withdrawal and anti-social behavior. He had been hospitalized in the Army prior to receiving an NP discharge in 1943. In 1946 he was given insulin therapy at a Veterans Administration hospital and discharged as a clinical recovery. He had adjusted moderately well until a month prior to admission when, after rejection by his girlfriend, he refused to go out and became verbally assaultive to his father.

After admission he lapsed into a catatonic stupor. He received a course of 20 EST's with only slight improvement. He was then put on combined treatment, receiving 55 insulin treatments and 9 more electroshocks. Although he improved somewhat he remained hostile, de-

manding, loud, at times with posturing and mutism. By August, 1950, he was sufficiently improved to leave the hospital on visit.

He was returned in August, 1951, and thereafter weekly maintenance EST's were necessary to alleviate his assaultiveness and intractableness. On May 6, 1953, cranial trephines were done. Procaine injection was postponed because he developed an elevated temperatureit wh periorbital swelling. The temperature rapidly fell to normal and on May 11 an injection done. The first injection (20 cc. bilaterally) and subsequent injections caused moderate pupillary dilatation but virtually no other disturbance in physical sign or alteration of the patient's anxious behavior. The first injection was followed by a series of eight generalized convulsions and a febrile reaction. The patient stated he felt better, and there was some clinical improvement noted. On May 21, 1953, 15 cc. of procaine were injected bilaterally. Two generalized convulsions followed as did a two-day period of hyperthermia. The third injection on May 27 (15 cc. bilaterally) was accomplished without complication. As there were increasing signs of tension, a fourth injection (35 cc. total) was done July 26. He again improved temporarily, but maintenance electroshock was reinstituted and continued until his transfer to a Veterans Administration hospital on December 23, 1954. Continuous efforts at psychotherapy were unsuccessful.

The rating scale score showed no significant change from the pre-treatment level.

Case V. (H. R.) This 26-year-old single man was hospitalized on May 26, 1947, for a schizophrenic reaction first manifesting itself with paranoid delusions about a year before while in the U. S. Navy. The precipitating factor for admission was sexual advances toward his mother. He received a full course of deep coma insulin combined with electroconvulsive therapy. He was discharged from the hospital as much improved September 20, 1947. However, within a month paranoid delusions reappeared, and he became gradually increasingly preoccupied with them so that he was returned September 12, 1948. He again received 60 insulin comas and 18 electroconvulsions and was discharged June 2, 1949. After a year he was again hospitalized. As in previous hospitalizations efforts at psychotherapy were of little effect, and because of blocking, negativism, refusal to eat and efforts at self-mutilation it was necessary to institute electroshock with maintenance level of about once a week. He also had a series of CO_2 treatments without effect.

In October, 1952, strenuous efforts at intensive psychotherapy were instituted, and the electroconvulsions discontinued. He improved in his verbal productivity and cooperation, but remained very withdrawn and seclusive.

On May 11, 1953, trephine and injection of 15 cc. of 1 per cent procaine bilaterally were done without incident or complication, except that the patient became nauseated with the first 5 cc. introduced and vomited three times during the procedure. Otherwise his behavior did not change; the usual autonomic changes were lacking. On May 19 he was reinjected with 5 cc. bilaterally. Again he stated he felt better and had fewer troublesome thoughts. A third injection of 10 cc. bilaterally was done on June 1, with minimal reaction other than nausea in each instance followed by vomiting that was in much the same pattern as with the first injection. The slight subjective improvement was maintained about six weeks when negativism and refusal to eat reappeared so that a brief course of electroconvulsive therapy (4) was reinstituted with slight improvement. Several more brief courses of electroconvulsive therapy at several month intervals were utilized before his transfer to a Veterans Administration hospital in August, 1954.

The patient's score on the rating scale at pre-treatment level was in the range of 45 to 55; post-injection it was 26 to 32.

Case VI. (F. E.) This severely intellectually and physically handicapped man was admitted at the age of 24 on March 3, 1953, with a history of a sudden onset of delusions about a week prior to admission. At the age of six he had a febrile illness, variously diagnosed, which resulted in progressive spastic muscular incoordination and arrested his intellectual development at the level of about seven years. For the preceding nine years strenuous efforts had been made to develop his interests and abilities, and he was able to set himself up in a weaving business at home which was doing well financially.

On admission he was found to be an emaciated boy with wasting of the interossei and lower leg muscles with choreo-athetotic movements of the head, arms, and legs. He spoke in a halting fashion with moderate stuttering. He had marked paranoid delusions and hallucinations. He misidentified. Psychotherapy, including sodium amytal interviews, resulted in a slight improvement in the first three weeks; but this was only temporary. He developed increasing negativism, silliness, and posturing.

On May 11, 1953, trephine and first injections were done. (The 24-cc. total injection was purposely directed 2 cm. anterior to the usual location above the sphenoid ridge so as not to produce autonomic change in this patient with evidence of extensive brain damage. Subsequent injections were made likewise.) At no time did autonomic or behavioral change occur during injection. Immediately the patient appeared more regressed, retarded, and mute. He was more aggressive with the nurses. There was a period of low grade fever following the first injection, but otherwise physical symptoms were at a minimum. A second brain injection (May 21—30 cc.) was followed by no particular improvement—indeed again the aggressiveness increased and patient refused at times to eat. A third injection was done on July 1 (30 cc.) with no improvement. On July 22, 1953, a course of EST was started with prompt improvement. A course of 11 resulted in the disappearance of his delusions and hallucinations. He became social and outgoing, participating in activities with the other patients. He was discharged on September 4, 1953.

In November, 1954, his mother stated that he has been doing very well at home, working at his loom with no trace of his psychotic illness which was diagnosed as schizophrenic reaction, paranoid type.

The rating scale scores were on the same level pre- and post-injection.

Case VII. (E. C.) This housewife was admitted November 6, 1953, at the age of 33 with an illness dating back some two and a half years and characterized by suspiciousness and paranoid delusions. She had had two periods of hospitalization with electroshock treatment which produced only an incomplete remission.

The patient first received a full course of deep coma insulin with electroshock (60 insulin and 12 electroshock) which were completed by February 20, 1953. She seemed somewhat less tense and more friendly. Paranoid delusions persisted.

Bilateral prefrontal trephines were performed May 22, 1953. Patient's hostility intensified before and during this procedure. Procaine injections were done on May 27, 1953 (10 cc. bilaterally), on June 1, 1953 (15 cc. bilaterally), and on June 9, 1953 (15 cc. bilaterally). During the course of each injection there occurred pupillary dilatation, rise in blood pressure, and slowing of respirations without striking change in behavior. This was followed by a marked fall in blood pressure for six to twelve-hour periods. No improvement was noted following the injections. She became increasingly hostile toward the psychiatrist, more evasive and more withdrawn at first, then more friendly and spontaneous. Her husband visited and found her to be "more relaxed and reasonable". As the family was very anxious to try her at home, she was discharged on August 3 to go to her parents' home for several weeks. Although the patient was displeased at not going directly to her home, she acquiesced to this plan.

According to the husband his wife improved drastically after leaving the hospital, "running the household and taking very capable care of the children". He spoke of her leading a completely transformed life a year after leaving the hospital. Analytic-type psychotherapy was not possible.

Prior to injection her ratings stayed 28–32, immediately after injection rose to 40–41, but was steadily declining and at the time of discharge had reached 24.

Case VIII. (M. U.) This woman first admitted at 33 years of age with a schizophrenic reaction, catatonic type of seven years' duration. Combined insulin and electroshock resulted in improvement and ability to return home.

Two and a half years later she re-entered the hospital seven months' pregnant. It was decided that procaine brain injections might be attended with less risk than electroshock or insulin. On June 5, 1953, cranial trephines were done. The next day the patient was much less blocked in speech, less manneristic and

more friendly. The first procaine injection on June 9, 1953, was terminated after a total of 15 cc. was injected because of a convulsion. She showed additional improvement. The second and third injections, both of 30 cc., were done within the next 10 days. In each instance the autonomic response during injection was striking, and over one hour was spent in accomplishing each of the 30 cc. injections. During each injection the patient appeared to become more communicative and cheerful to the point of euphoria. She was discharged on July 1 with an absence of mannerisms and blocking, but with some preoccupation about the details of living.

At home the husband felt she was better able to handle the children, but she remained generally withdrawn from outside social contacts. She delivered a normal male infant on August 5.

She was returned to the hospital on November 28, 1953. She was about as sick as on her previous admission. She was re-injected on December 10 with 30 cc. of procaine, again having a convulsion. She seemed slightly more friendly and spoke of feeling "more free and more able to think". A second injection was postponed because of hyperthermia with some nuchal rigidity which rapidly cleared on penicillin therapy. She visited her family at Christmas and did so well the husband requested her discharge.

Within three months she was hospitalized in another hospital for five weeks. After her return home she was put on chlorpromazine therapy which made a marked change in her behavior so that the husband stated in March, 1955, that she was well as far as he could see.

The rating scale dropped from 28 to 21 following the trephine, then to 3–4 after the first series of injections; it had risen to 25 at the time of return to the hospital and declined to 16 after the second series.

Case IX. (D. S.) Prior to her trephine and brain injection this 33-year-old paranoid schizophrenic had been ill for more than six years with a reaction characterized by many delusions, hallucinations, and destructive acts. She had been treated twice with insulin coma therapy. The first course, two months after onset of her acute illness, had resulted in a nine-month remission; the second in minimal hospital improvement. Attempts at psychotherapy using multiple therapists had been unsuccessful, and she had been maintained on weekly electroshock therapy.

She received a series of three bilateral injections of 15 cc. procaine at eight and nine-day intervals. The patient showed minimal autonomic and behavioral changes through the course of each injection, but the third injection was followed by a single convulsion. A very slight decrease in her hostile behavior resulted, but there was little change in her over-all picture or in her relationship with the staff. Three months later it was necessary to restart maintenance electroshock. She is still in the hospital essentially unchanged.

The rating scales showed no significant changes.

(Very recently chlorpromazine has effected a very slight improvement.)

Case X. (W. M.) This patient was first admitted in 1940 with paranoid delusions of several years' duration. A diagnosis of schizophrenic reaction, paranoid type, was established; she received a course of 32 insulin treatments and was discharged in April, 1940. Over a year later, after a visit to a paranoid aunt, her delusions and withdrawal symptoms reappeared leading to rehospitalization. Again she received insulin and was discharged in August, 1941, after 49 treatments. During the next hospitalization from January 20, 1943, to October 24, 1943, she received 20 electroshocks. She was taken out of the hospital against advice and returned home where she lived with psychotic symptoms until April, 1949, when she re-entered the hospital because of her open sexual behavior. She received psychotherapy, then insulin coma therapy and electroshock, but she remained hallucinated, delusional and withdrawn with occasional outbursts of anger and destructiveness.

The first procaine injection was done on June 23, 1953, four days after trephining. A second injection followed on June 26 and the third on July 10. Each was of 15 cc. bilaterally. Autonomic changes were invariably minimal, and the patient remained tense, vituperative, and combative through the course of each procedure. The patient was less blocked after the second injection, volunteering conversation and entering into more activities with the

other patients and personnel. She showed more interest in her personal appearance. There was one other possibly significant factor in the treatment which was the assignment of a special duty nurse for her for an approximate four-week period. Within another month these slight gains had been lost. She was not amenable to psychotherapy. At present the patient is still in the hospital essentially unchanged from her pre-injection status.

The rating scales score was 72 prior to injection, declined to 52 for several weeks immediately post-injection, and then rose again to the range of 66–72 in another month.

Case XI. (A. E.) In 1943 this patient was first diagnosed as "having a long standing deep-seated malignant psychoneurosis of the obsessive-compulsive type with a great amount of anxiety". In 1949 he withdrew and refused to leave his house. In 1951 he became delusional about having diabetes, but his psychiatrist was able to get him to go to work. Out-patient EST precipitated a paranoid flurry which quieted down to a paranoid schizophrenic reaction with auditory and visual hallucinations. On being hospitalized on September 19, 1953, his clinical picture was one of tension and auditory and visual hallucinations. Cranial trephinations were done on October 5, 1953, followed by hyperthermia. Fifteen cc. were injected bilaterally on October 19. He then stated he still heard voices, but he showed no tension or anxiety; he said they did not worry him. He was incontinent for three days. He left on visit on December 7. On March 10, after he took an overdose of Tuonal, he was brought back to the hospital. He then received deep insulin coma and electroshock with very slight improvement again to the state of his delusions and hallucinations not bothering him. He again worsened in several months. Thorazine (50 mg. 4 x q.d.) was not effective. He was discharged against advice but continued out-patient supportive psychiatric therapy. He has had no emotional outbursts. He feels more hopeful about the future and has fewer somatic complaints.

The rating scales showed no significant change.

Case XII. (B. D.) This 25-year-old musician was admitted to the hospital on May 1, 1953, for severe obsessions and compulsions of at least eight years' duration. He had had psychotherapy and electroshock without success prior to admission and psychotherapy and a full course of insulin after admission, again without improvement.

He received three procaine injections in a three-week period in October; in each one a total of 30 cc. was used. The first injection was followed by two convulsions and a violent febrile reaction. Urinary and fecal incontinence developed, and the former continued up to his discharge on December 6 although it had improved to the point where it occurred once every three days. His clinical picture of obsessive thoughts and compulsive acts did not change. He was discharged as being worse than on admission.

Within three weeks of discharge he became continent. His bathing rituals disappeared, and he dressed without slowness. He began to talk incessantly, using obscene language at home. He spends all the money he can get his hands on. He still is unable to work. The family, however, feels he is "much improved" because he no longer confines himself to his home. It would be generous to classify him as slightly improved.

The score on the rating scale was 15–18 before treatment and had climbed to 48–49 after, and then was falling at time of discharge when it was 38.

Case XIII. (F. M.) The patient was first admitted at the age of 28 from November 11, 1941, to February 24, 1942. Her diagnosis then was schizophrenic reaction, hebephrenic type, and she was treated with insulin. Her condition on discharge was unimproved. Her existence out of the hospital in the intervening years until her readmission on November 29, 1952, was characterized by withdrawal, seclusiveness, and ideas of reference with overconcern about body odors, halitosis and cleanliness. There was no precipitating exacerbation of symptomatology but rather a gradual increase of despondency and seclusiveness leading to her return.

On admission she was very hostile, negativistic, and demanding with episodes of destructiveness when frustrated. Prolonged attempts at psychotherapy met with little success, and on November 9, 1953, she received her first

procaine injection (15 cc. bilaterally). There was no personality change nor confusion following this procedure. Two days later the injections were repeated, and this time were accompanied by confusion which lasted several hours. The following day she was less tense but more suspicious and delusional. It was not possible to arouse her anger. The third injection was done on November 19, 1953. Irritability was replaced by apathy. Gradually there was a return of some tension. At the time of discharge on February 1, 1954, she had clinically maintained some improvement in that she was able to converse more readily and spontaneously. She no longer engaged in her prolonged bathing and eating routine and was sleeping better.

The patient has been able to live outside a hospital, but remains psychotic.

Case XIV. (H. B.) This 58-year-old housewife was admitted November 18, 1953, as a transfer from another hospital where she had been in treatment for an illness of three months' duration with the diagnosis of manic-depressive reaction, depressed type. Along with psychotherapy she had received 12 electroconvulsions, sustaining a severe compression fracture of the spine. She had improved but relapsed after the shocks were terminated.

She had had at least two previous episodes of psychosis, the last one 16 years prior to her present admission and requiring several years of hospitalization. The symptomatology, then as at this time, included depression, agitation, negativism, somatic delusions, insomnia, refusal to eat, and suicidal attempts.

Diagnoses of rheumatic heart disease and healed pulmonary tuberculosis were established. Because of progression of the symptoms and failure of the patient to respond to the hospital program, somatic therapy was felt to be advisable to break up the psychosis. Therefore, after assessment of the added danger due to her impaired cardiac function, procaine injection was decided upon.

On January 13, 1954, two weeks after digitalization and under sodium pentothal anesthesia, the burr holes were made, 13 cc. of ventricular fluid were removed and approximately 20 cc. of 1 per cent procaine injected. As the incisions were being closed respirations became irregular and ceased in spite of stimulants and artificial respiration. Cardiac arrest ensued.

Autopsy revealed: "A small subdural hematoma on the right at the site of the needle perforation about 4 cc's in amount, but no hemorrhage along the course of this tract. On the left there was a small hemorrhage in the needle tract at its depth near the ventricle and about the insula with a small amount of blood (0.5 cc's) in the ventricle."

Comment. These findings force the assumption that this was a physiologic death. There was no extensive hemorrhage, and the finding of extraventricular clot close to the wall of the ventricle may be evidence that injected procaine could have entered the ventricular system. On the other hand, striking but transient autonomic changes occur so frequently with proven extraventricular injection of procaine in the frontal lobe that it seems reasonable such early changes, unrecognized in the patient unconscious from pentothal, could readily progress to full respiratory arrest with continuation of the injection. Although flooding of the small ventricle of an animal with procaine solution results in collapse and respiratory arrest, the surgeon believes he can readily tell when his needle is in communication with the ventricle in the human, and if such free communication does not exist, the diffusion of a portion of a 5-cc. injection into the ventricular system would probably not cause dire results. Recently the routine has been to color the injected solution and to secure ventricular fluid subsequently whenever there was a strong autonomic reaction. No evidence of diffusion of injected solution into ventrical has been found.

From experience with over 120 injection procedures in 41 patients, it can be argued that the injection of procaine will not produce a fatal reaction, that such autonomic change as does occur reaches its peak within five minutes, and that an additional 5-cc. increment is safe when one is not exaggerating a previously-noted physiologic disturbance. An untoward degree of reaction has occurred only when injections were made more hastily or when signs and physiologic depression were obscured by sufficient sedation to produce unconsciousness. It should be stressed that the safe performance

of this procedure results in a time-consuming procedure with up to one hour being required for each of four injections in a given patient's course of treatment as opposed to the relatively brief period of time required to complete a standard frontal lobotomy.

Results

The injection of 1 per cent procaine solution into the frontal lobe was without complication in five of the 14 patients treated. One death occurred (this is commented on under the Report of Cases—Case XIV). Five patients had generalized convulsive seizures at the time of the injection or within a few hours; none has had any convulsions subsequent to the immediate post-treatment period. As only one of the five patients who convulsed had anti-convulsant phenobarbital medication for 24 hours prior to injection, better anti-convulsant therapy might have prevented this complication. Five patients developed a febrile reaction following the injection. Incontinence was seen in two patients, lasting three days in one and two months in the other.

The clinical condition of the patients in the period immediately following injection was:

Much improved	2
Slightly improved	4
Very slightly improved	2
Unimproved	4
Worsened	1
Died	1

At the end of the follow-up period, which was at least a year post-injection, the patient's clinical condition was re-evaluated from a psychiatric viewpoint and classed as:

Recovered	2	All living outside a hospital
Much improved	3	
Improved	1	
Very slightly improved	1	
Unimproved	6	one living outside a hospital

A total of eight was living outside a hospital. During the follow-up period, two patients relapsed and were retreated by procaine injection with subsequent clinical improvement. Two other patients listed as "very slightly improved" in the immediate post-treatment phase relapsed to their pre-treatment level but were not retreated. Six patients had additional somatic therapy of various types. Four of these had electroconvulsive therapy with "recovery" noted in one. Chlorpromazine was used on three patients with "much improvement" in one, very slight effect in another, and no effect on the third. Combined insulin and electroconvulsive therapy was accompanied by improvement in one.

Discussion

With such a small group of patients and with no controls, evaluation of the effectiveness of procaine injection cannot be definitive. A procedure which results in an immediate improvement rate ("much improved" and "slightly improved") of six out of 14 is not impressive, for it is not significantly different from a one out of three rate that is reported with so many forms of somatic treatment used with psychotic patients (2). However, such a summarization is not very useful. The individual patient, his clinical history and course must be studied in the light of clinical experience. Considering the severity and chronicity of the reaction streated, the abrupt and drastic change effected in a few cases was impressive. This was particularly true for the cyclic schizophrenic (Case I) and one of the obsessive-compulsives (Case II). It was also true for some of the others classified as unimproved, such as the schizophrenic, Case XIII.

Those patients who had shown significant even though temporary response to previous somatic therapy (e.g., Case I, II, VII, VIII) were the ones who responded best to procaine injections. On the other hand, those (e.g., Case III, IV, V, XIII) who had shown very little response to recent somatic therapy and on whom one would think only an extensive surgical lobotomy might possible effect a change did not respond to procaine injection.

The failure of Case VI to respond despite the short duration of his illness and his subsequent good response to electroconvulsive therapy may have been due to the fact that the injection was done well forward of the sphenoid ridge so as not to produce undesirable autonomic disturbances. In this connection it is of interest that transient autonomic changes (dilatation of pupils, sweating, rise of blood pressure and pulse rate, depression of respiration and sensorium) seem to have been an

invariable accompaniment of every injection that produced benefit and that in those instances (Cases V, IX, X) where no striking autonomic change occurred, the results were poor. The observation that two patients (Cases I and VIII) showed some improvement following the trephinations, but before procaine injection, points up the fact that the psychological factors in a somatic therapy cannot be ignored.

The fact that two patients clearly relapsed, one after six months and the other after four months, raises interesting, but presently unanswerable, questions concerning the nature and duration of effect of the procaine injection, the course of the psychiatric reactions in that patient, and the interaction of the frontal lobes, the central nervous system, and the personality.

Assessment of the value of this treatment at the end of the follow-up period was complicated by the fact that such a large number of patients was subjected to other types of somatic therapy. The number significantly improved ("recovered", "much improved", and "improved") is six out of the 13. The movement of the patients into and out of an improved status between the immediate post-treatment evaluation and the end-of-follow-up evaluation again forces one to study the individual patient.

With respect to the patients' participation in psychotherapy, the changes brought about by the injections did not live up to hopes. It was not possible to establish the particular type of psychotherapeutic relationship desired in spite of their improvement. Whether this was due to a "lobotomy effect" of the injection, to the type of disturbance in the patient's interpersonal relationships, or a deficiency in the skills of our present-day psychotherapists remains unclear.

In its present crude form this procedure may well deserve a place in the treatment of the inaccessible patient who still shows a satisfactory, but transient, response to electroshock or insulin therapy because of the strong possibility of securing a long remission without resorting to destructive lobotomy. Although the cases were too few to subject to conclusive analysis, it was the opinion of the group that in these patients the so-called "frontal lobe syndrome" deficit was definitely less than that expected if the group had been subjected to either the classical open or transorbital surgical lobotomy. Further study is indicated to establish whether this method can produce the desired clinical results without "personality downgrading". More precise stereotaxic injection of this agent, or other agents, may lead to greater success with the method in psychosis and may well help to clarify the argument over functional specificity of frontal lobe areas as opposed to the concept of non-specificity with partial effects resulting from partial lobe dysfunction. The procedure is probably as safe as electroshock if injections are accomplished slowly and cautiously in the carefully observed conscious patient.

Summary

The procedure of injecting a 1 per cent procaine solution into the prefrontal portion of the brain was utilized in fourteen psychiatric cases with an immediate result of much improvement in two, slight improvement in four, and one death.

At the end of a follow-up period of at least a year, during which other somatic therapies were also used, two patients were found to have recovered, four patients to be much improved. These much improved patients were not able to participate in an "uncovering" type of psychotherapy.

Prefrontal procaine injections have been found to affect the course of, and to have a limited therapeutic usefulness in, psychiatric disorders.

BIBLIOGRAPHY

1. Adams, J.: Unpublished report.
2. Appel, K. E., Myers, J. M., and Scheflin, A. E.: Prognosis in psychiatry: Results of psychiatric treatment. *Arch. Neurol. & Psychiat.*, *70:* 459–468, 1953.
3. Buccaille, M.: Infiltrations novocainiques et alcoolisations du cerveau préfrontal pour la traitement des douleurs irreductibles. *Rev. chir.*, 348–363, November–December, 1952.
4. Hoff, H.: Actualites Scientifieques Et Industrielles 1170, Premier Congress Mondial de Psychiatrie. Paris 1950, III Section Anatomo-Physiologie Cérébrale, pp. 56–57.
5. Lindsay, J. S. B.: Frontal block: Some observations on effects of local anaesthetic injections into cerebral hemispheres of rabbits and psychotic patients. *J. Ment. Sc.*, *96:* 923–934, 1950.
6. Mandl, F.: Kann die Lobotomie bei Schmerzkranken durch eine intrakranielle Injection ersetzt werden? *Wien. klin. Wchnschr.*, *63:* 13–16, 1951.
7. Moniz, E.: *Tentative operatoires dans la traitement de certaines psychoses.* Paris: Masson, 1936.

8. Myers, J. M., Nulsen, F. E., Dillon, H., Drayer, C. S., Pearson, M. M., Grant, F. C., and Smith, L. H.: An obsessive-compulsive reaction treated with prefrontal procaine injection. *J. A. M. A., 153:* 1015–1016, 1953.
9. Nulsen, F. E., and Grant, F. C.: Relief of pain in advanced carcinoma by prefrontal injection of procaine. *Arch. Neurol. & Psychiat., 69:* 653–654, 1953.
10. Putnam, T. J.: Procaine base in iodized oil introduced transorbitally as a test for effects of lobotomy. *Tr. Am. Neurol. A., 75:* 125–128, 1950.
11. Smith, L. H.: Critique of somatic therapies. Academic Lecture, Sixth Mental Hospital Institute, Minneapolis, Minnesota, October 20, 1954 (unpublished).
12. Soulairac, A., and Barbizett, J.: Sur la production de sections encéphaliques temporaires par injections intracérébrales de substances anaesthesiques. *Compt. Rend. Soc. Biol., 140:* 966–968, 1946.
13. Van Wagenen, W. P., and Lin, C. T.: Procaine block of frontal lobe white fibres as a means of predicting the effect of prefrontal lobotomy: Clinical evaluation. *J. Neurosurg., 9:* 30–51, 1952.

4401 Market Street
Philadelphia 4, Pennsylvania

THE POSSIBILITY OF PSYCHOSOMATIC INVOLVEMENT OF THE CENTRAL NERVOUS SYSTEM IN SCHIZOPHRENIA

SILVANO ARIETI, M.D.[1]

Three factors have greatly handicapped neurology in its effort toward an understanding of psychological and psychopathological problems. The first factor is shared with the rest of medical sciences. Physicians, trained in the scientific tradition, are reluctant to use any method which is not strictly empirical. Mental constructions, working hypotheses, are generally frowned upon as armchair speculations, more appropriate to the field of philosophy than to the field of medicine, and complete reliance has been put upon laboratory experiments and clinical observations. Obviously it would be absurd to minimize the tremendous accomplishments obtained through clinical and experimental research. Nevertheless, physicians should once more compare their research with those in the fields of physics and chemistry, where great progress has been made by a combination of experiments and a formulation of theoretical hypotheses. Such an eminent scientist as James B. Conant (11) thinks that "the history of science demonstrates beyond a doubt that the really revolutionary and significant advances come not from empiricism but from new theories." Obviously, sooner or later it is necessary to submit any new theory to the empirical test. In spite of the predominant anti-theoretical trend, even in the field of neurology, theoretical concepts like those of Jackson (21) and Goldstein (17) and the more recent theory of emotion advanced by Papez (34) have been very fruitful in stimulating important work.

The second factor which has delayed neurological progress toward psychological understanding consists of the poor use of data offered by related fields. For instance, it is the belief of the writer that a more intense application of a genetic approach, such as the one followed by Werner (38) in the field of psychology, and a greater use of the findings of Cassirer (10) and Langer (26) in their studies on the symbolic functions of the mind, could enrich neurology very much.

The third factor is the relative disregard of neurology which dynamically-oriented psychiatrists (with a few outstanding exceptions, like those of Grinker, Kubie, David Rioch, Ostow and E. Weinstein) have recently acquired. Overreacting to previous positivistic approaches, most of them feel that neurology has not much to offer to the understanding of dynamic psychology, and they tend to ignore this field, whereas they maintain much closer relations with other branches of medicine, like internal allergy, dermatology, etc.

The present writer is one of the dynamically-oriented psychiatrists who believe that neurology has great contributions to make to psychology if its boundaries are enlarged. He fully subscribes to DeJong's point of view, expressed recently in an editorial (12) that "Neurology is an expanding discipline, and it must not be limited by arbitrary boundaries—it must reach out beyond its customary confines."

An area where further expansion is urgently needed is the study of the central nervous system itself in the field of psychosomatic medicine. Only an historically-determined trend toward disconnecting psychiatry entirely from neurology is responsible for the fact that whereas every organ or system of the body (such as skin, cardiovascular and gastrointestinal apparatuses, etc.) has been recognized as affected by many psychosomatic disorders, the central nervous system has been given only secondary consideration. And yet the central nervous system is the organ of highest functionality; it is the organ which is first affected by psychogenic stimuli before they are channeled toward the other organs of the body. Could it not be that under a certain psychological stress a more or less specific functional disintegration of habitual neuronal patterns takes place?

In the following pages the author will consider the possibility of a functional alteration of the nervous system in schizophrenia. A study of the primary psychogenic factors which

[1] From the Department of Psychiatry, State University College of Medicine at New York City, Brooklyn, N. Y.

lead to the condition is beyond the purpose of this article, and therefore a complete interpretation of the disorder will not be attempted.

Whereas those authors who have been interested in determining the role of the central nervous system in schizophrenia have chiefly investigated the possibility of organic pathology, although histologic evidence was lacking or controversial, we shall be concerned with another problem, that is, what parts of the central nervous system are functionally involved in the symptomatology of schizophrenia.

It seems beyond doubt that most of the symptoms of schizophrenia, at least in the initial stage of the illness, are *mediated* through the cerebral cortex. This statement does not exclude the theoretical possibility of an extracortical pathology in the etiology of schizophrenia. The author of this article does not believe so, but some researchers think that some pathology of the diencephalon or of the pituitary-adrenal system is responsible for the disorder. However, even if such hypotheses could be confirmed, symptoms like delusions, hallucinations, ideas of reference, word-salad, etc., would have to be recognized as cortical phenomena, which could occur only in the presence of an extracortical pathology.

These symptoms involve high symbolic processes and require the function of the cerebral cortex, regardless of whether the cortex is in a normal or pathological condition, and regardless of whether a pre-existing extracortical pathology is necessary to enhance the disorder.

The second step in our thinking consists in determining what cortical areas are involved in the pathological symptoms of schizophrenia. At this point we may make a general statement, already implied in the foregoing: all the cortical areas, whose function is well known today, do not seem to be *primarily* involved in the symptoms of early schizophrenia. For instance, it is obvious that the motor, sensory, extrapyramidal areas, etc. are not primarily involved in schizophrenia. If a patient, as a result of a delusion, commits an absurd action, many cortical areas, like the visual, pyramidal, extrapyramidal, are of course involved in the execution of this action, but the participation of these cortical areas is not pathological *per se*. It is the motivation, the symbolic meaning and lack of control of the absurd action which

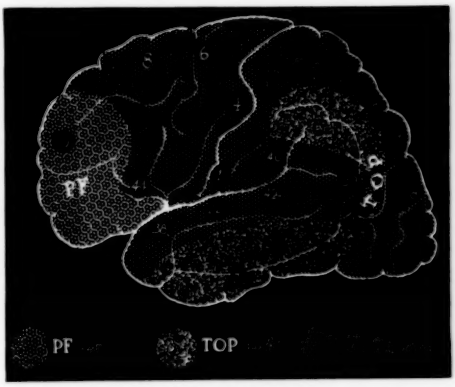

FIG. 1. Cerebral hemisphere showing extension of PF and TOP areas. Explanation in the text.

are pathological. If we exclude the sensory and motor areas and the language centers as directly or originally involved in the psychopathology of schizophrenia, only three cortical areas are left to be considered. One is an ill-defined area including most of the temporal lobe and very small parts of the occipital and parietal lobes. We shall call this area TOP area (from Temporal, Occipital, Parietal) (fig. 1). The second important area occupies the whole prefrontal area. We shall refer to this area with the abbreviation PF. The third area consists of the archipallium and mesopallium, including the rhinencephalon, the hippocampus, the cingulate gyrus and possibly the posterior orbital gyri. Part of this area borders on the TOP area.

We shall take these three areas into consideration separately.

TOP Area

Anatomically, this area includes a large part of the temporal lobe (Brodmann's areas 20, 21 and 37) and a small part of the parietal and occipital lobes, consisting of the most central parts of Brodmann's areas 7, 19, 39 and 40. The parietal part is crossed by the interparietal sulcus. Histologically in Nissl sections it resembles the structure of the sensory associative areas. It receives projections from the lateral thalamic nucleus and from the pulvinar. The part of area 19 which is included in the TOP area possibly belongs more to the parietal than to the occipital lobe. It also has projections from the pulvinar.

Much less is known anatomically of the temporal part of the TOP area. Krieg (25) calls this area one of the great *terrae incognitae* of the cortex. Thalamic connections to and from this part of the cortex have not been well established.

Phylogenetically the TOP area is one of the most recently evolved areas. Even such high species as Pithecanthropus Erectus and especially Homo Rhodesiensis had only a rudimentary development of this area, as may be deduced from Tilney's writings (36). Furthermore, together with other neopallic areas, it has no direct connections with the "reticular system" of the brain stem.

From a point of view of neuropathology, the TOP area is rather seldom involved in pathological conditions which could reveal its specific functions. Hemorrhages, softenings or neoplasms are generally unilateral. In addition they either do not involve the totality of this area or, if they do, they expand to surrounding regions.

In senile psychosis and cerebral arteriosclerosis the TOP area is involved less than the prefrontal area. Maybe this relative resistance to the senile or arteriosclerotic process is to be attributed to a different blood supply. Whereas the prefrontal area receives its supply mainly from the branches of the anterior cerebral arteries, the TOP area is irrigated by branches of all the three major arteries of the brain.

The TOP area is involved in Pick's disease, but this point will be taken into consideration later in this paper.

From a physiological point of view the TOP area may be considered as the center of functionality of a much larger area including the whole parietal, occipital and most of the temporal lobes. These three lobes form that part of the brain which receives stimuli from the external world and processes them into progressively higher constructs. We may divide this large part of the brain into four levels.

Before examining these four levels separately, however, we must make it clear that we do not consider them as sharply-defined physiological entities. Following the teaching of Jackson, when we attribute a function to a particular cortical area, we mean only that that function is represented predominantly but not exclusively in that area. The cortex is to be conceived not as a mosaic of distinct localizations, but as a pattern of overlapping representations, which are all more or less connected. These overlapping representations, however, have a relative concentration in certain areas. When we refer to levels, we refer only to these relative concentrations.

The first level consists of what Orton (33) called the arrival platforms. It includes the borders of the calcarine fissure, Heschl convolution, and the post-central gyrus (with other contiguous small areas of the parietal cortex and small portions of the pre-central gyrus). These are the areas where crude sensation occurs.

The second level is the level of perception or recognition. It consists of area 18 for vision, a portion of the first and maybe second temporal gyrus for hearing, and an undetermined area of the parietal lobe for general sensation. If lesion occurs at this level, the patient is not able to perceive, that is, to recognize what he experiences. He suffers from various forms of asymbolias like, for instance, psychic blindness. At this level conditioned reflexes occur. This is also the level at which the symbolic activity of the mind manifests itself in the form of *signs*. A sign is something which stands for something else which, however, is present or about to be present in the total situation of which the sign is a part (26). For instance, the ringing of the bell is the sign for the trained dog of the incoming food.

The third level (parts of Brodmann's areas 22, 39, 40, 19) is much more complicated. Although it may exist in a very rudimentary form even in some high infrahuman species, it is only in humans that it acquires prominence. The following are some of the functions of this complicated level:

As Nielsen (32) has described, voluntary recall of past sensations and experiences takes place at this level. This function implies some kind of primitive abstraction because in recalling one must separate or abstract a recognized experience from the other memories with which it was associated. The experience which was recognized at the second level is now abstracted from memories and voluntarily revisualized. In order to function in this way at this level, the subject must have the ability to reproduce mentally *the image* of the external stimulus. Images are not signs, but *symbols*, inasmuch as

they stand for something which is *not present*. Since the images do not reproduce exactly the external objects, they are the most elementary creative functions of the individual. They retain an individual, private character and cannot be shared with any other human being.

At this level many other functions occur. Not only images, but external stimuli (caused or not caused by the individual) start to stand for something else which is not present and, therefore, become *symbols*. Phylogenetically, symbols are preceded by *paleosymbols*, which are symbols valid only for the person who creates them. For instance, a person sees a connection between a sound and a situation or object, and that sound becomes the paleosymbol of the object or the situation. The paleosymbol becomes a symbol when its symbolic value has been accepted by at least a second person. The symbol produces in the person who pronounces it the same response that he produces in others (30). Verbal communication and socialization start at this level. For instance, if in a premordial human family one of the siblings happens to associate the sound ma-ma with the mother or with the image of the mother, and if a second sibling understands that the sound ma-ma refers to mother, language is originated. Language consists of *social* or *common symbols*. But at this level the sound ma-ma refers only to a particular mother, the mother of the two siblings, and not to any mother. In other words, the symbol ma-ma *denotes*, but does not possess much *connotation power* (1).

Lack of space does not permit a discussion of the connections of this third level with the frontal lobes, connections which permit an expansion of the faculty of speech. All the language centers belong to the third level although, as we shall see shortly, they would not have expanded without the influence of the fourth level.

Most authors follow Orton (33) in recognizing only the three mentioned levels of elaboration. According to the present author a fourth level must be differentiated, which anatomically consists of the TOP area (Brodmann's areas 20, 21, 37, parts of 7, 19, 39 and 40). This is the area where all the excitements coming from the lower levels are synthesized and elaborated into the highest mental constructs. Of course, as we have already mentioned, we must not consider this area as isolated or functioning by itself. First of all it is associated by fibers which pass through the corpus callosum, with the corresponding area of the opposite hemisphere. It is also connected with much lower structures through the archipallium. As we shall see shortly, it has important connections with the frontal lobes, without which it could not function at all. Furthermore, one should by no means think that only the TOP area is required for the highest mental processes. The neuronal network which mediates the highest mental processes extends to much lower levels. (See engram in figure 2.) However, the highest engrams or esthesotypes, to use a very appropriate concept recently proposed by Mackay (29), need a place in the TOP area, almost as a center toward which all the associations of which they consist converge. The fact that the esthesotype extends to many lower levels has confused several researchers and has fallaciously led to conclude that no cortical localization is possible and that what counts is only the extension of the cortical area.

But let us go back to the TOP area. In the opinion of the writer this area is needed for the highest processes of abstraction. These processes presuppose and require processes of socialization, which in simple forms have already started at the third level. As I have illus-

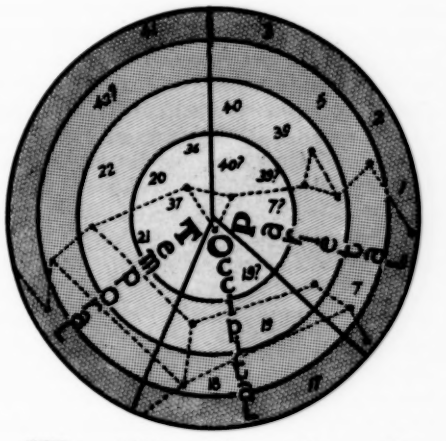

FIG. 2. Diagram showing the four cortical levels of integration, represented schematically as four concentric areas in the temporal, occipital and parietal lobes. The numbers refer to Brodmann's areas. Explanation in the text.

trated elsewhere, no high abstraction is possible if the individual in his development has not come into contact with other people (1). It is through contact with other human beings that verbal symbols continue to increase in number and that those previously acquired develop abstract meaning, that is, *connotation* or *categorical significance*. For instance, the term mother eventually refers not only to the mother of the individual or the mother of all the siblings, concept which is generally connected with one visual image, but to any mother, to mothers in general. In the TOP area, the thought processes become more and more elaborated and more distant from paleosymbols, images and perceptions. The TOP area also facilitates or permits the full expansion of the third level. In fact language would consist only of a few words, and only with *denoting* power, if processes mediated at the fourth level would not require a tremendous increase in vocabulary. This is another instance of the overlapping of levels which I have described elsewhere (1).

In figure 2 the temporal (with the exception of the hippocampus and related structures), the occipital and the parietal lobes are represented in a circular diagram. The four concentric circles represent the four different levels of integration. At the center is located the TOP area toward which all the other levels of elaboration converge. Like all diagrams, this one is just intended as a didactical device and, as such, oversimplifies complicated neurological mechanisms. Among the important things which for sake of simplification are omitted in the diagram, are: 1) The associations between the different parts of temporal, occipital and parietal lobes; 2) the associations with other cortical areas, like the frontal lobes; 3) the associations between the two hemispheres; 4) the cortico-subcortical associations. Furthermore, the spatial proportions of the different areas are not exactly respected.

In my opinion there is no doubt that the functions mediated in the TOP areas are altered in the schizophrenic syndrome. Coordinating the experiences of many authors with my own, I have described in detail elsewhere how in schizophrenia there is a gradual return from the abstract to the concrete, from a form of highly socialized symbolization to a form of symbolization which is decreasingly conceptual and social and more perceptual in character (1). Even the thought processes, deprived of abstract symbolization, abandon our common logic and become paleologic (2, 3, 4). At first the symbols lose the connotation power and denote only; then they become paleosymbols, that is, understood only by the patient; finally they become completely perceptualized or regressed to the levels of images or perceptions, as in the case of hallucinations. In other words, in schizophrenia there is a reluctance or inability to use engrams or esthesotypes which need neurons located in the TOP area. At first there is a tendency to lose only the functions of the neuronal patterns which include the central parts of the TOP areas; later, as the illness progresses, there is a tendency to avoid almost entirely the functions of neuronal patterns which require any part of the TOP areas, and there is an inclination to use only the functions mediated by the first, second and third levels. In other words, there is a reduction or simplification in the neopallic neuronal configurations of the highly symbolic mental processes.

The foregoing does not imply at all that the TOP areas of the two hemispheres are affected by some kind of organic pathology. The disintegration or loss of their functions may be viewed as psychogenic. Their functions, in fact, by permitting complicated interpersonal relations and human conflicts may engender the greatest anxiety in human beings.

With this partial or complete psychogenic elimination of the functions of the TOP areas, however, the schizophrenic does not obtain adjustment at a lower level of integration. In the process of evolution all the nervous areas readjust themselves, by means of new associations, every time a new area appears, changes or extends. The whole nervous system and especially the cortex is in a state of maladjustment when the TOP areas are in a state of decreased functionality, even if this decreased functionality is psychogenic in origin. In other words, the schizophrenic regresses but does not integrate at a lower level, just as an experimental animal of a species normally provided with the cortex does not integrate at a noncortical level when the cortex is experimentally removed, because its whole organism is adjusted or attuned to the presence of the cerebral cortex. The schizophrenic's disintegration

will continue. Furthermore, together with the eliminations of the functions of high levels (Jackson's negative symptoms), there is a resurgence of inhibited functions (Jackson's positive symptoms), such as paleologic thinking, perceptualization, etc.

In several patients whom I have examined after decades of illness and who were reduced to vegetative existence in back wards of state hospitals (5, 6), I have observed also agnosia to pain, temperature and taste, and a syndrome not too dissimilar from psychic blindness and primitive habits, reminiscent of the one described by Klüver and Bucy (22, 23, 24) in monkeys after bilateral removal of the temporal lobes. The crude sensations remained. It could be that in these patients the areas of functional impairment extended beyond the TOP areas and involved also the third level and part of the second.

PF or Prefrontal Area

For didactical purposes we have taken into consideration the TOP area first, but the prefrontal area is even more important in the psychogenesis of schizophrenia. The TOP areas elaborate the material coming from the external world, but it is the prefrontal areas which permit this elaboration to a degree where schizophrenogenic conflicts are possible.

Increasing evidence indicates that the functions of the PF areas are very important, even if these functions are hard to define and, to a certain extent, still obscure. In addition to control of some visceral functions, at least four psychological functions of the prefrontal lobes have so far been recognized. These four functions are certainly interrelated and possibly different manifestations or different degrees of the same basic process.

The first function is the ability to maintain a steadfastness of purpose against distracting impulses from the environment (28); in other words it is the function of focal attention. The importance of focal attention as a prerequisite for higher mental processes has been very well illustrated by Schachtel (35). As Schachtel writes, each act of focal attention does not consist just of one sustained approach to the object to which it is directed, but of several renewed approaches. Focal attention requires ability to suppress secondary stimuli and to delay the response.

It is obvious that the high elaborations of stimuli described in connection with the temporal, occipital and parietal lobes could not take place if this function of the prefrontal lobes would not permit it.

A second function of the prefrontal areas is the ability to anticipate the future. Whereas animals are able to anticipate events which occur only within a very short period of time (from a few seconds to a few minutes from the time the stimulus took place), man is able to anticipate mentally distant events. The importance of this faculty in the engendering of anxiety cannot be overestimated; in fact anxiety is based on *anticipation* of danger, as Freud has repeatedly shown. As I have written elsewhere in more detail, even without the faculty of distant anticipation, anxiety is possible, but only a short-circuited anxiety similar to that experienced by infrahuman animals (7). In animals, anxiety is experienced when the stimulus indicates a present danger, or a danger which will follow shortly after the stimulus, or when the animal is at the same time stimulated by two conflictful stimuli. In addition to this type of anxiety, human beings experience long-circuited anxiety, that is, an anxiety which is due to anticipation of distant danger. This anxiety persists even when the external stimulus has disappeared because the external stimulus is replaced by an internal one, that is, by a chain of mental processes which permit the anticipation of distant future. Anticipation of distant future would not be possible if the individual would not receive high forms of symbols from the third and fourth levels of the posterior brain. For instance, for the calf the mother cow exists only when he perceives her, that is, when the visual stimulus of the cow or another stimulus, which is simultaneously associated with the cow or follows at very brief interval, is perceived. But a man can think of his mother even when the mother is absent because he is able to substitute mother with the symbol "mother". The symbol "mother" places mother in the three temporal dimensions: past, present, future.

A third function of the prefrontal lobes is the ability to permit planned or seriatim functions. By seriatim functions is meant the organization or synthesis of skilled acts or thoughts into an orderly series (31). Although some high species, like monkeys and apes, are capable of

simple seriatim series, this function expands very much in man. Seriatim functions imply ability 1) to anticipate a goal, and 2) to organize and synthesize acts or thoughts in a given temporal sequence for the purpose of reaching the anticipated goal (9).

The fourth function of the prefrontal lobe is the ability to make choices and to initiate the translation of the "mental" choice into a motor action.

Some experiments have proved that infrahuman animals also learn to choose; that is, they learn what choice to make in certain experimental sets and what choice not to make (19, 39). These experiments are valuable in the study of "equivalent stimuli" and of a function of primitive abstraction, but do not really demonstrate the presence of the ability to choose as it exists in human beings. Long-circuited choice as it occurs in human beings implies: 1) inhibition of secondary stimuli, ranging from spurious stimuli to suggestions from other people (first function); 2) ability to anticipate the goal and the effect of a certain action as well as of other possible actions (second function); 3) planning the possible actions in a seriatim pattern (third function); 4) actually selecting one of the possible actions and initiating the movement, that is, translation of the plan into motor action.

These four steps actually include many substeps which cannot be taken into consideration here. We must emphasize once more, however, that these steps could not take place if the posterior brain would not provide high forms of symbolism.

Now there is no doubt that these functions of the prefrontal lobes are disturbed in schizophrenia. The one which comes first to our mind is the ability to anticipate the future. This function is an absolute prerequisite for long-circuited anxiety and is the basis of any complicated mental conflict. In schizophrenia it tends to be teleologically replaced by more primitive processes which require shorter circuits. The same thing could be repeated for seriatim thinking. Greenblatt and Solomon (18) feel also that the frontal lobe circuits sustain the emotional tension of the psychotic, and Freeman and Watts (14) have well described the importance of future anticipation in the engendering of psychoses. These functions do not seem to be very disturbed in well systematized paranoids, possibly because at the beginning of the illness these patients resort predominantly to the mechanism of projection in the attempt to remove anxiety. At a subsequent stage, however, these functions become impaired in paranoids too. The delusions change from the persecutory to the grandiose type and are more and more related to the present time: "I *am* a king."

The other prefrontal functions are also disturbed in schizophrenia. The ability to make choices or to translate thoughts into actions is particularly altered in catatonia, but this point will not be discussed here as the author plans to illustrate it in detail in another contribution. As to the ability for steadfastness or focal attention, we know that it is very much impaired in schizophrenics. Their span of attention is very limited.

Archipallium and Hypothalamus

The archipallium and the hypothalamus may be thought of as playing an important role in schizophrenia. Since great importance is attributed today to these structures in the mechanism of emotions, we could even be inclined to think that an altered functionality of the archipallium could explain the affective impairment which is so pronounced in schizophrenia. One could even be induced to the hasty conclusion that the original cause of this mental condition is to be found in this part of the nervous system. At the present stage of our knowledge, such possibility cannot be denied categorically. However, to the author of this article such an interpretation seems improbable. The author, of course, is directed by the fundamental idea, which may prove wrong, that the first functions and structures to be affected in schizophrenia are the last to appear in phylogenesis. If a *primary* dysfunction of the archipallium, which is the most ancient part of the cortex, will be demonstrated, all the genetic theories which so far have proved so valuable in both the fields of neurology (Jackson) and of dynamic psychiatry (Freud) will collapse.

The author does not mean that the archipallium is not involved in schizophrenia. On the contrary, a neopallic dysfunction, even if functional, is bound to have important repercussions upon the archipallium too. If we follow again Jackson's principles, we may think that the hypofunctionality of neopallic areas

must be accompanied by a release and hyperfunctionality of the archipallium. Since we know so little about the functions of the archipallium and of its single parts, we cannot explain how this release is manifested, or why, for instance, instead of increased emotionality we find decreased emotionality in schizophrenia. Of course, under the name archipallium many different structures are included whose interaction is almost completely obscure. The interesting study on cats by Bard and Mountcastle (8), however, may throw some light on this subject if their findings are valid for the human species too. These authors produced a state of placidity in cats by removing the neocortex. After this operation anger and sham rage could not occur, and nociceptive stimuli elicited only mild responses. However, if the same animals were subjected to removal of the gyrus cinguli or to other parts of the rhinencephalon, they became angry and ferocious. These interesting experiments seem to indicate that archipallic structures inhibit the hypothalamus. In other words the neocortex restrains the inhibitory functions of the rhinencephalon. If the neocortex does not function, the rhinencephalon increases its inhibitory function on the hypothalamus. This increased inhibition may explain also the impairment in the *expression* of emotion which we find in schizophrenia. It may, moreover, explain the defective homeostatic biochemical functions in schizophrenia which have been described by many authors (15, 20) and which are connected of course with the functions of the hypothalamus and of the visceral brain.

General Interpretation

We shall recapitulate now what has been expounded, and we shall examine the problem also from the point of view of other neurological concepts. According to the author's conceptions, the schizophrenic, in a teleologic attempt to escape from overwhelming anxiety, avoids certain complicated psychological functions. such as interpersonal relations, high forms of symbolism, anticipation of future, seriatim planning, etc. But these functions are predominantly mediated in the cortical areas which are the highest in the evolutional scale, that is, which are the last to appear in phylogeny and the last to myelinize in ontogeny. In this paper these cortical regions have been called the PF and the TOP areas. There is thus in schizophrenia a tendency to avoid the function of these areas, that is, a psychogenic hypofunctionality of these areas and a tendency instead to use simpler circuits. In other words, there is a psychosomatic attempt to return to a lower level of integration, a level which does not permit long-circuited anxiety or interpersonal relations, a level which corresponds to one at which long childhood dependency on others is not needed. Orton (33) too thought that shorter circuits or cross-overs are used in schizophrenia and especially in catatonia, but he thought that the process involved was organic and affected specifically the centers connected with the longer circuits.

In the writer's conception, at the same time that these cortical centers or parts of them are in a state of psychosomatic hypofunctionality, other centers or some other parts of them, or some lower neuronal configurations or patterns are released and cause characteristic symptoms. Hughlings Jackson's concepts are valid in relation to schizophrenia too. For instance, when logical thinking is impaired, paleological thinking comes to the surface. When social symbols disappear, paleosymbols replace them. Concepts become more and more perceptual, and anticipation of the future is replaced by thoughts concerning the present.

One could raise the objection that an organic condition affecting *bilaterally* the PF and the TOP areas should give a symptomatology similar to schizophrenia, but that so far this occurrence has not been reported. Actually the only organic disease which would approximate a bilateral involvement of these areas, and these areas exclusively, is Pick's disease. In Pick's disease the symptomatology is similar to that found in cases of very regressed schizophrenics, who have been sick for many years, but has very little in common with the symptomatology of early cases. In both Pick's disease and schizophrenia there is an impairment of the abstract attitude described by Goldstein, that is, there is occurrence of Jackson's negative symptoms. However, in schizophrenia there is also a resurgence of many positive symptoms (paleologic thought, hallucinations, etc.) which are not present in Pick's disease. This may be due to the fact that in Pick's disease, as well as in other organic conditions, several levels are affected at the same time,

and therefore a release of inferior cortical processes is prevented. We know in fact from neuropathological studies how diffuse are the alterations. In Pick's disease they do not involve only association areas, but also primary centers and many subcortical structures (13). Even when the lesions are patchy, we can hardly believe that they selectively involve only some higher neuronal configurations and respect lower. This state of affairs explains why Jackson's positive symptoms are not so clearly seen in organic conditions which involve the cortex. Functional conditions involving the cortex are in my opinion a better demonstration of Jackson's concepts than the organic. For instance, Goldstein's studies, which concern predominantly organic cases, have emphasized the impairment of the abstract attitude but have not sufficiently studied the characteristics of the re-emerging concrete attitude, because these characteristics can hardly appear when several levels or sublevels are affected at the same time.

Re-emerging primitive functions as a rule are not useful to the patient although they include also those restitution symptoms studied by Freud (16). In fact, as we have already mentioned, the regressed patient does not become adjusted, but maladjusted at a level at which he cannot integrate. The hypofunctionality of the neopallic areas which we have examined must also alter associations with other areas, not only the neighboring one but also the distant, through long association bundles, commissures like the corpus callosum, the corticothalamic and thalamo-cortical tracts, etc. This is a process of functional diaschisis, similar to the organic diaschisis described by Von Monakow (37). Direct connections of these neopallic areas with the brain stem reticular system do not seem to exist (27). The brain stem reticular system is of ancient origin and seems more concerned with the basic physiological than with the symbolic functions of life. However, undoubtedly indirect connections exist through the archipallium.

We may visualize in schizophrenia also a process which may be called of functional *dysencephalization*, in a certain way the opposite of *encephalization*. As it is well known, with the latter term some neurologists have called the shifting toward higher centers of the functions which in lower species are mediated by lower or more caudal centers. In schizophrenia the opposite takes place: not only is there a return of the functions of the released lower center but also a tendency of the function of the higher center to be mediated by the lower center. For instance, often abstract thought processes which take place in the highest centers are mediated instead at a perceptual level and become auditory hallucinations.

The three processes of the re-emergence of lower functions, of functional diaschisis and of dysencephalization determine a state of dysequilibrium and of psychological splitting, which is so characteristic of this mental disorder. How does the organism defend itself from this disorganization? With further regression. The process thus repeats itself in a vicious circle that leads to complete dilapidation. This circular process is one of the characteristics of functional regression which is lacking in organic conditions. In the latter we may have the phenomenon of diaschisis, but there is not complete disintegration because the resurgence of the functions of lower levels or sublevels is minimal in comparison to functional conditions. If further deterioration occurs, it is only because the organic process itself expands or produces other damages, like gliosis, hydrocephalus, hemorrhages, etc. Some intoxications, however, just as those caused by mescaline, may be selective enough in their physiological action to reproduce a specific cortical hypofunctionality, and subsequent subcortical dysfunctions, similar to the ones occurring in schizophrenia.

In conclusion the schizophrenic process may be viewed as a psychosomatic or teleologic attempt to integrate the patient at a lower level. With comparatively few exceptions, however, this attempt fails because the process engenders other self-perpetuating mechanisms which lead to regression. An artificial partial attempt to integrate the schizophrenic at a lower level is, of course, made by frontal leucotomy and other psychosurgical procedures. These procedures have scientific validity because they remove, at least partially, the functions of such areas as the PF and do not unchain progressive regression. However, whether one should change a psychosomatic disorder for one which, together with symptoms, removes permanently a great part of the essence of man and reduces him to an almost infrahuman state, appears questionable to those who today see an increasing hope in the psychotherapeutic approach.

Summary

Two areas of the cerebral cortex are considered very important in mediating the symptomatology of schizophrenia. The first area includes a large part of the temporal lobe (Brodmann's areas 20, 21 and 37) and small parts of the parietal and occipital lobes (central sections of Brodmann's areas 7, 19, 39 and 40). The second area includes the prefrontal lobes. It is demonstrated how in schizophrenia there is a gradual impairment or decrease in the functions of these areas and a return of primitive mechanisms. A third area, which consists of the archipallium, is also considered very important in the symptomatology of schizophrenia, but only secondarily involved.

The described cortical impairment is considered psychogenic, aiming at a return to levels of organization where overwhelming anxiety, derived from high forms of symbolism, cannot be experienced. The process is thus seen as a teleologic regression which, however, fails inasmuch as it brings about nervous mechanisms which complicate rather than simplify the dysequilibrium.

BIBLIOGRAPHY

1. Arieti, S.: *Interpretation of Schizophrenia.* New York: Brunner, 1955.
2. Arieti, S.: Autistic thought. Its formal mechanisms and its relationship to schizophrenia. *J. Nerv. & Ment. Dis., 111:* 288, 1950.
3. Arieti, S.: Special logic of schizophrenic and other types of autistic thought. *Psychiatry, 11:* 325, 1948.
4. Arieti, S.: Primitive intellectual mechanisms in psychopathological conditions. Study of the archaic ego. *Am. J. Psychotherap., 4:* 4, 1950.
5. Arieti, S.: The placing into mouth and coprophagic habits. *J. Nerv. & Ment. Dis., 99:* 959, 1944.
6. Arieti, S.: Primitive habits and perceptual alterations in the terminal stage of schizophrenia. *Arch. Neurol. & Psychiat., 53:* 378, 1945.
7. Arieti, S.: The processes of expectation and anticipation. Their genetic development, neural basis and role in psychopathology. *J. Nerv. & Ment. Dis., 102:* 367, 1947.
8. Bard, P., and Mountcastle, V. B.: Some forebrain mechanisms involved in the expression of rage with special reference to suppression of angry behavior. *Res. Pub., A. Nerv. & Ment. Dis., 27:* 362, 1947.
9. Brickner, R. M.: *The Intellectual Functions of the Frontal Lobes; a Study Based upon Observation of a Man Following Partial Bilateral Frontal Lobectomy.* New York: Macmillan, 1936.
10. Cassirer, E.: *The Philosophy of Symbolic Forms.* New Haven: Yale University Press, 1953.
11. Conant, J. B.: *Modern Science and Modern Man.* New York: Columbia University Press, 1952.
12. DeJong, R. N.: Editorial. *Neurology, 5:* 353, 1955.
13. Ferraro, A., and Jervis, G.: Pick's disease. Clinicopathologic study with report of two cases. *Arch. Neurol. & Psychiat., 36:* 739, 1936.
14. Freeman, W., and Watts, J. W.: *Psychosurgery.* Springfield, Ill.: Charles C. Thomas, 1942.
15. Freeman, H., and Carmichael, H. T.: A pharmacodynamic investigation of the autonomic nervous system in schizophrenia. *Arch. Neurol. & Psychiat., 33:* 342, 1935.
16. Freud, S.: Psychoanalytic notes upon an autobiographical account of a case of paranoia (dementia paranoides). *Collected Papers, 111:* 387, 1946.
17. Goldstein, K.: *The Organism. A Holistic Approach to Biology Derived from Pathological Data in Man.* New York: American Book Company, 1939.
18. Greenblatt, M., and Solomon, H. C.: *Frontal Lobes and Schizophrenia.* New York: Springer Publishing Co., 1953.
19. Hamilton, G. V.: A study of trial and error reactions in mammals. *J. Anim. Behav., 1:* 33, 1911.
20. Hoskins, R. G.: *The Biology of Schizophrenia.* New York: Norton, 1946.
21. Jackson, J. H.: *Selected Writings.* London: Hoder and Stoughton, 1932.
22. Klüver, H., and Bucy, P. C.: "Psychic Blindness" and other symptoms following bilateral temporal lobectomy in rhesus monkeys. *Am. J. Physiol., 119:* 352, 1937.
23. Klüver, H., and Bucy, P. C.: An analysis of certain effects of bilateral temporal lobectomy in the rhesus monkey with special reference to "psychic blindness". *J. Psychol., 5:* 33, 1938.
24. Klüver, H., and Bucy, P. C.: Preliminary analysis of functions of the temporal lobes in monkeys. *Arch. Neurol. & Psychiat., 42:* 972, 1939.
25. Krieg, W. J. S.: *Functional Neuroanatomy.* Philadelphia: The Blakiston Co., 1947.
26. Langer, S. K.: *Philosophy in a New Key.* Harvard University Press, 1942.
27. Livingston, R. B.: Some brain stem mechanisms relating to psychosomatic medicine. *Psychosom. Med., 17:* 347, 1955.
28. Malmo, R. B.: Interference factors in delayed response in monkeys after removal of frontal lobes. *J. Neurophysiol., 5:* 295, 1942.
29. Mackay, R. P.: Toward a neurology of behavior. *Neurology, 4:* 894, 1954.
30. Mead, G. H.: *Mind Self and Society.* University of Chicago Press, 1934.
31. Morgan, C. T.: *Physiological Psychology.* New York: McGraw-Hill, 1943.
32. Nielsen, J. M.: *Agnosia, Apraxia, Aphasia. Their Value in Cerebral Localization.* New York: Hoeber, 1946.
33. Orton, S. T.: The three levels of cortical elaboration in relation to certain psychiatric symptoms. *Am. J. Psychiat., 8:* 647, 1929.
34. Papez, J. W.: A proposed mechanism of emotion. *Arch. Neurol. & Psychiat., 38:* 725, 1937.
35. Schachtel, E. G.: The development of focal attention and the emergence of reality. *Psychiatry, 17:* 309, 1954.
36. Tilney, F.: *The Brain from Ape to Man.* New York: Hoeber, 1928.
37. Von Monakow, C. V.: *Die Lokalisation in Grosshirn und der Abbau der Functionen durch Korticale.* Wiesbaden: Bergman, Herde, 1919.
38. Werner, H.: *Comparative Psychology of Mental Development.* Chicago: Follet, 1948.
39. Yerkes, R. M.: Modes of behavioral adaptation in chimpanzees to multiple choice problems. *Comp. Psychol. Mono.*, 10, 1934.

18 East 76th Street
New York 21, New York

ADDITIONAL CONTRIBUTIONS TO THE SENSORIMOTOR INDUCTION SYNDROME IN UNILATERAL DISEQUILIBRIUM WITH SPECIAL REFERENCE TO THE EFFECT OF COLORS[1]

L. HALPERN, M.D.[2]

The sensorimotor induction syndrome in unilateral disturbed equilibrium occurs more frequently than supposed and would be recognized more often if the knowledge of its symptoms and methods of examination were brought into closer range of neurologic interest. Therefore, each additional observation is valuable since it confirms former experience and furnishes new facts suitable for expanding the theory and practice of the sensorimotor induction. With this aspect in view the following observations are discussed below.

Clinical Observations

A. General clinical picture

Case 1: R. Sch., a woman, aged 26, had been healthy up to three years ago when her illness began. At the onset of the disease she suffered from attacks of vomiting which persisted for about 2 weeks. She then suddenly lost consciousness and remained so for 3 hours. After regaining consciousness she could not see well with her right eye and, when standing, was not able to hold her balance. The vision in her right eye improved but remained blurred, and her gait was still uncertain. As a space-occupying process was suspected, pneumoencephalography was performed in another hospital on three different occasions with negative results. Afterwards the patient suffered from headache and dizziness. At the same time mobility of her legs became impaired so that she was confined to bed. She also became aware sometimes of using her right arm clumsily.

On first admission, 2 years ago, no pathological changes in the internal organs were found. Neurologic examination revealed slight bilateral nystagmus, absence of the abdominal reflexes and of the patellar reflex on the right as well as Rossolimo's sign on the left. In addition, the patient showed at this time a systematized *disturbed equilibrium* on the *right* which presented the features of the *syndrome of sensorimotor induction*. The diagnosis of multiple sclerosis was considered. After 2 months' hospitalization the patient's gait improved, and she was discharged from the hospital.

She was admitted for the second time 6 months ago after an attack of loss of consciousness which lasted for about one hour and which was preceded by a general feeling of ill-health and exhaustion. After regaining consciousness vision was blurred in her *right eye*, and she could not walk well because the power in her right leg was impaired. Neurologic examination revealed diminution of power at all the joints of the right arm and leg, the leg assuming a varus position. All qualities of superficial and deep sensibility as well as stereognosis were intact. The abdominal reflexes were absent, but the ankle and patellar reflexes were elicited, the latter being more lively on the right. In addition, a slight bilateral nystagmus on fixation was found. The reaction of the pupils, visus (5/5 on both sides), fundi and fields of vision were normal. Hearing was also normal on both sides. Caloric examination, after Kobrak, showed no reaction, but on testing with 10 cc. ice-water a transient aggravation of the existing nystagmus resulted without effecting a deviation in the pointing test. The spontaneous impairment of the equilibrium, affecting the right side of the body, and its manifold influences on sensory perception will be demonstrated later. X-ray of the skull, the electroencephalogram, and the spinal fluid were normal.

B. Special examination of the induced sensorimotor manifiestations

a. Features of the right-sided disequilibrium. The patient, with eyes open, kept her head straight. However, with her eyes shut, her *head* and whole body inclined increasingly to the *right*, without her being aware of it. When standing, with her eyes shut, a tendency to fall to the *right* and backward resulted. When standing and closing her left and right eye alternately, the tendency to fall appeared only when the *right* eye was *open*. When seeing with her *left eye only*, the tendency to fall was *eliminated*. It was also influenced by changing the position of the head, in that turning it to the left increased the tendency to fall to the right, while turning it to the right abolished it.

When the patient, with her eyes shut, was asked to stretch out both arms and to keep them in this position, the *right* arm *descended* and *deviated* outward without the patient's being aware of it (fig. 1). When asked to raise

[1] This study was supported by the Julius and Marie Scheider Neuropsychiatric Fund.

[2] From the Neurological Department and the Neuropsychiatric Outpatient Department of the Rothschild-Hadassah-University Hospital, Hebrew University Hadassah Medical School, Jerusalem, Israel.

FIG. 1

one arm and then place the other at the same level, the patient, with her eyes shut, placed her *right* arm always *lower* than her left. When asked to raise her legs and to keep them at the same level, the right leg descended, a movement which in this instance was felt by the patient. Turning of the *head* to the *left* accelerated the change in the position of the right extremities, while turning it to the *right diminished* and delayed the change. The position of the extremities on the right was also tested after closing her left and right eye alternately, with the result that an effect concerning the right arm only was noted. When seeing with the right eye only, the same spontaneous deviation of the arm occurred as on closure of both eyes, while when seeing with the left eye only, the deviation was diminished and delayed.

When performing the finger-nose test and localizing the midline of her body, the patient past-pointed with her right hand to the right. The same past-pointing outward was noted when executing the knee to heel test with her right leg. With her left arm and leg she performed these tests correctly. However, on repeated performance of the pointing test a swinging deviation of the left arm to the right appeared as a result of the ever-increasing deviation of the whole body to the right. The patient, however, corrected this movement and correctly localized the target. These findings were confirmed on repeated examination.

b. Perceptual disturbances in the haptic and tactile spheres. When the patient, with her eyes closed, was asked to hold a rod vertically, she always placed it with its upper end *inclined* to the *right*, and when asked to hold it horizontally, she placed it with its *right* end inclined slightly *downward*.

With her eyes shut, a small rod was placed on the patient's chest, first on the right and then on the left side. She perceived its position on the left side correctly, but on the right side it seemed to be inclined with its upper end outward to the right. A small rod placed horizontally on the right side seemed to be inclined with its right end downward. When the rim of a water-glass was pressed on the left side of the patient's chest, she felt it correctly as being round (fig. 2a); on the *right side*, however, the rim appeared *ellipsoid*, with its long diameter extended to the *right* (fig. 2b). Corresponding changes were perceived when the glass was placed in the middle of the chest (fig. 2c). This faulty perception of coordinates and figures became aggravated with increasing inclination of the body to the right.

When the same tests were performed after *alternately* closing the left and right eye and after exclusion of visual control, different results were obtained. On closure of the left eye only the same effect was obtained as on closure of both eyes. However, on closure of the right eye only, the deviations in tactile perception mentioned above were not observed any more, and the spontaneous inclination of the body to the right was eliminated too.

When the patient, with her eyes shut, was given two identical wooden cubes, the one in her *right* hand seemed to be *bigger*. When she continued holding them, she expressed herself more exactly by saying that the cube in her right hand was enlarged at its right outer edge which appeared elongated, thicker and spread out. This finding which was always obtained on closure of both eyes appeared likewise on closure of the left eye only. On closure of the right eye only this effect was completely removed, and the patient correctly perceived the objects in both hands.

When the patient was asked to estimate the weight of two identical wooden spheres, the one in her *right* hand seemed to be *heavier* than that in her left. This faulty perception was also found on closure of the left eye only, but did not occur on closure of the right eye only.

c. Various disturbances of visual perception. The patient stated spontaneously and also on questioning that at times vision in her right

eye was blurred. At the same time she generally felt worse. Reading too was difficult occasionally, in that the letter she looked at seemed to be doubled and the printed line to be inclined downward to the right. The patient became aware also that she could not estimate distances well. As an illustration she was convinced that a chair which was lifted and put down behind another patient would directly hit that patient. When she wanted to grasp an object, she sometimes made too short a movement and had to make an additional movement in order to reach it. She also observed that she groped outward with her right hand. When smoking she did not flick the ash off into the middle of the ash-tray but deposited it at its right outer rim.

Thorough examination revealed various disturbances of the *visual* functions which manifested themselves in the *right* eye only.

Visual perception of geometrical figures was impaired. This became apparent when she looked with her right eye at an objective vertical line. The upper end seemed at first to move jerkingly to the right till finally the whole line seemed inclined to the *right*. This deviation was confirmed on repeated tests, and its degree could be influenced by a motor or a sensory stimulus. The motor stimulus consisted in the deviation of the right outstretched arm described above. The test was now performed in such a way that the patient was asked to look with her right eye at a vertical line while her outstretched arms were covered with a blanket in order to exclude visual control. The patient who perceived the vertical line with its upper end inclined to the right was astonished to note that on continued fixation the line deviated more. This visual effect on the right eye corresponded with the increasing deviation of the right arm, of which the patient was not aware. The sensory stimulus originated from the left eye which remained open, but was separated by a partition. Then, on seeing the vertical line with her right eye, the angle of deviation was reduced by a half. Also horizontal lines when looked at with the right eye seemed inclined, although to a smaller degree, with the right end downward. Corresponding to these deviations of the coordinates, a right angle when looked at with the right eye seemed to be rotated, while it was perceived correctly when looked at with the left eye. When looking with the right eye at a circle, the right part of it seemed at first to move jerkingly outward but was finally perceived as being elongated to the right, so that the circle appeared to be an ellipse. When seeing with the left eye only, she perceived the circle correctly.

When the patient was asked to write and to draw, seeing alternately with her left and then with her right eye, she performed this task correctly when seeing with her left eye only.

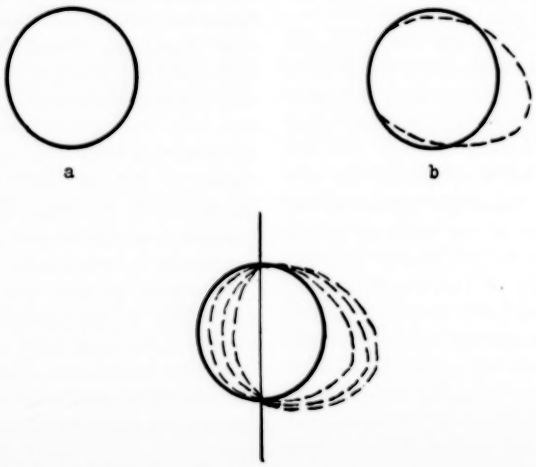

FIG. 2

When seeing with her right eye only, the line of writing deviated downward to the right. So, when writing Hebrew script from right to left, it ascended to the left, while when writing Latin script from left to right, the line of writing inclined downward to the right. The patient was not aware of these deviations.

Another difference when using the left and right eye alternately concerned the size and shape of the drawings. When the patient was asked to use her right eye only and to copy drawings which she had made before, using her left eye only, it became apparent that the figures were seen altered and enlarged at once or after repeated performance. This alteration affected the drawing of simple figures, like rectangles and circles, as well as that of complicated ones like houses, etc. This alteration concerned the right outer part of the figures in that the vertical lines deviated to the right and the horizontal lines were elongated downward to the right. It further became evident that closed figures like circles or squares remained *open* at their *right outer* part and became *elongated* (fig. 3). This corresponds with the faulty visual localization to the right, mentioned above, which became apparent in the flicking off of the ash of a cigarette on the right outer rim of the ash-tray. It is of interest that the corrective influence of the left eye manifested itself here also and resulted in an essential reduction of the deviations. Further it must be stressed that the drawings in this instance were not performed with the disequilibrated right hand but with the left one, as the patient is left-handed. This fact must be mentioned in particular, in order to exclude every doubt as to the visual origin of these disturbances.

The difference in the visual perception with regard to form and size, when seeing with the right and left eye alternately, became evident in this patient not only when drawing but also when *looking* at objects like square or rectangular building-blocks, which were correctly perceived when viewed with the left eye only. On continued observation with the *right* eye, the patient stated that the right outer part of the building-block began to change, to move outward, and to become thickened and *elongated* at its right outer part. These results which were found on repeated testing could not be obtained when the patient used her

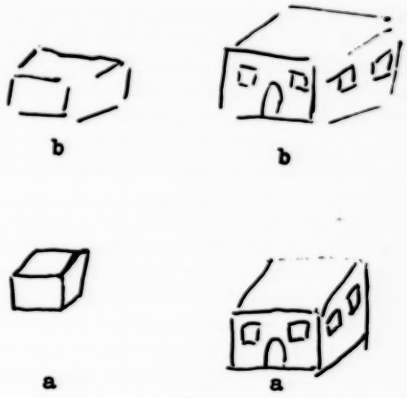

FIG. 3
a—drawn when seeing with the left eye.
b—drawn when seeing with the right eye.

right eye only while the left eye remained open but screened, as was demonstrated above. Another visual disturbance manifested itself in the perception of dotted lines. While these were seen correctly with the left eye, they were perceived as being continuous when using the right eye, the distance between the points being 1–1½ mm. This disturbance could be influenced too by the motor and sensory stimuli mentioned above. The increasing deviation of the right arm, of which the patient was unaware, coarsened the differentiation and she saw the line as continuous, even if the distance between the points was bigger, but the corrective influence of the left eye effected an improvement of differentiation, even if the distance between the points was smaller.

Another impairment of interest, which manifested itself in the right eye only, concerned *color perception*. The patient was able to distinguish and to arrange all colors correctly even the most delicate shades when using her left eye only. When using her right eye, however, and asked to look at a series of colored samples, it became evident that the colors *changed* immediately and more definitely the longer she looked at them. The darker colors like blue, brown, and grey were perceived as being black and were arranged accordingly. Lighter colors, however, seemed to be greyish, whereas red and yellow changed least of all. When the colored samples were arranged in a row, it became apparent further that the impairment concerned chiefly that part of the

samples which was situated in the *right outer* sector of the field of vision and which was regularly noted, even when the sequence of colors was changed. The extent of impaired color perception was diminished also in this instance by the corrective influence of the left eye and increased by the motor effect of the right arm.

d. The influence of colors on the pathological phenomena. As was demonstrated above, the alternate closure of the right and left eye produced throughout a different effect on the motor and sensory functions. When the patient used her right eye, the same results were obtained as when closing both eyes, while, when using her left eye only, a corrective influence on the existing disturbances was always produced. This latter finding of a corrective effect of the contralateral eye gave rise to the idea of testing the influence of colors on the existing disturbances. The first rough tests with colored glasses, while the right eye remained closed, yielded surprising results. Thorough examination of the effect of the various colors was performed with Kodak Wratten filters. The postural attitude of the patient using her left eye served as the basic point of comparison. In this attitude the body remained straight while the right arm descended for about 10 cm. without deviation outward and was kept in this position. When a pure red glass of Wratten Filter 24 was placed before the patient's left eye, her whole body started rocking immediately and became inclined markedly to *the right* while at the same time the right arm descended and deviated widely to the right. Orange light of filter 21 produced a much lesser disturbance than pure red. After red, yellow of Wratten filter 8 and 3 produced a less disturbing effect on the postural pattern. Green of filter 11, although subjectively perceived correctly, was in its disturbing effect most similar to yellow of filter 3 but had a more aggravating influence on the postural attitude than green of Wratten filter 63. This is explained by the fact that green of filter 11 allows the rays of the red spectrum to pass and shows plainly that the organism reacts here more sensitively than the eye. The same results were obtained on testing with the color blue of filters 38 and 44 A which both were subjectively perceived as being blue. Blue of filter 38 caused a deviation of the head to the right and descent of the right arm for 40 cm. Blue of filter 44 A, however, caused a lesser deviation of the head to the right and descent of the arm for 15 cm. This difference in the biologic effect is explained by the spectral difference in the color, as blue of filter 38 lets through the red spectrum, while blue of filter 44 A hardly lets through any red at all. When pure blue of Wratten filter 50 (4250 A) was placed before the patient's left eye, the postural disturbances described above did *not* appear at *all*, and the effect was even demonstrably better than when using the left eye only. Surprisingly, it became apparent further that this blue produced an active corrective influence even after the postural changes caused by red had already started and progressed. It was then sufficient to put blue of filter 50 before the left eye, whereupon the postural displacement of the body and the right arm soon ceased and a return to complete normality began. The marked inclination of the body to the right lessened and reversed by rocking movements, while at the same time the right arm ascended jerkingly till it reached the level of the normal left arm. It must be mentioned that the patient was *not aware* of all these postural changes as the tests were always performed after exclusion of visual control. The patient stated that, when looking at red, breathing became difficult and palpitation and nausea developed. In contrast to these disturbing sensations caused by red and which were also clinically apparent, the patient felt subjectively completely well when using a blue glass. The same basic subjective and objective effect of red and blue was also found in the right eye, with the difference that the deteriorating effect of red was much stronger here than in the left eye and that the corrective effect of blue was less manifest in the right eye than in the left. The influence of these colors concerned not only the motor components of the unilateral disequilibrium but also the homolateral sensory disturbances such as overestimation of size and weight in that they were increased by red and eliminated by blue. All these findings were obtained invariably on repeated testing during a period of several months, though the results would vary sometimes in their degree.

e. Acoustic discomfort and optic function. The effect of colors on disturbances of body

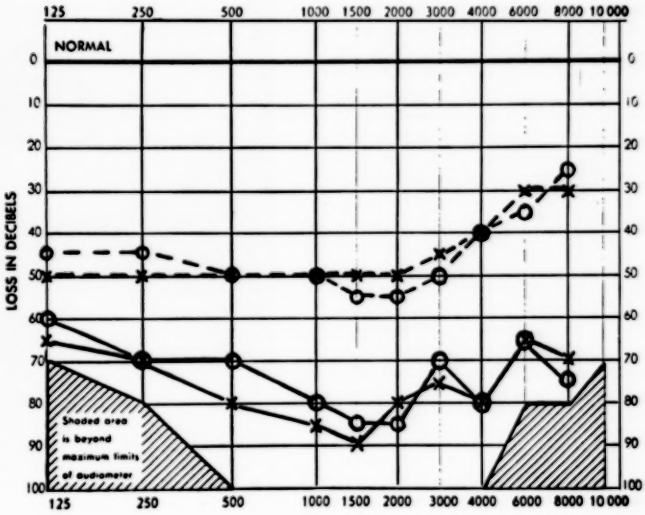

FIG. 4

0—right ear.
x—left ear.
- - - - Threshold of acoustic discomfort under influence of red.
—— Threshold of acoustic discomfort under influence of blue.

posture gave rise to the thought that sound might produce a corresponding influence. Audiometric testing did *not show* any effect on the existing disturbances when using pure sounds of 125 to 10,000 dv. But it became evident that the right-sided postural disturbances were *affected* adversely by *acoustic discomfort*. As soon as the threshold of discomfort was reached by increased intensity in all the frequencies, a visible deterioration of the spontaneous disturbances set in. The stronger the intensity, the stronger and quicker the inclination of the body to the right and deviation of the right-sided extremities occurred. Further examination showed, on the other hand, that the threshold of acoustic discomfort was influenced invariably by visual function and by colors. The threshold of discomfort was then tested on alternate opening and closure of both eyes. With eyes open, the threshold of discomfort was within the normal limits of 60 to 75 db., while it dropped to 55–25 db. when the eyes were shut. On closure of the left eye only, the threshold of discomfort was reduced like on closure of both eyes to 55–25 db., especially in the higher frequencies. On closure of the right eye only, nearly similar values as on opening of both eyes were obtained, namely 60–80 db. When the influence of color was now tested on the open left eye, it was always found that red light of Wratten filter 24 lowered the threshold of discomfort from 60–80 db. to 55–25 db. mainly in the higher frequencies, while it was raised by blue light of Wratten filter 50 to 60–90 db. (fig. 4) even above the original level. These positive and negative changes with regard to the threshold of discomfort were always accompanied by corresponding improvement and deterioration of body posture.

A. General clinical picture

Case 2: N. J., aged 18, came to Israel with her parents 8 years ago. Being followers of the Bahaite religion they made their home near the tomb of their prophet in Haifa.

The patient, who is the fifth child in a family of eight, seems to have developed normally. She began her schooling in Teheran, and after her arrival in this country she continued her studies in a mission-school in Acre. This Bahaite family suffered greatly from the hostile attitude of the Arabs in whose midst they were living. This unfriendly atmosphere did not fail to make an impression on the sensitive girl. She became introverted, did not take part in the social life of her school, and became the more attached to her family.

The patient stated, that her illness began 3 years ago with loss of consciousness following an alarming

incident. She was present when Arabs attacked her brothers, and when she saw them lying on the floor covered with blood, she thought they were dead. In the evening of this day she had her first attack of loss of consciousness which has recurred since repeatedly at varying intervals. Because of these attacks she received anti-epileptic treatment. During the last 6 months she has suffered from continuous *left*-sided headache and, as in addition *cerebellar* symptoms were found on examination, the patient was admitted to the department for diagnostic clarification.

During a 2 months' stay in the hospital she had several attacks which presented the same basic symptomatological features. Emotional factors seemed to play a part in their causation. The attacks always started with a *raising* of the *left arm* and a strong compulsing *turning* of the *head* and usually also of the whole body to the *left*. Sometimes the body turned then to the right. A generalized powerful *extension spasm* appeared thereafter in all extremities. Unconsciousness occurred at once at the beginning of the attack and lasted from 10 to 45 minutes. Sometimes additional turning of the body around its longitudinal axis occurred. During the attack the eyes were always shut spasmodically, and at its beginning a deviation of the eyes to the left was always found, while reaction of the pupils to light was always normal. The Babinski sign was not elicited, and tongue biting and urination did not take place. The patient stated that she sometimes felt the approach of the attacks in the form of a tremendous power which subdued her without her being able to resist and without her knowing afterwards what had happened to her.

General examination of the patient did not reveal any pathological signs in the internal organs. Neurological examination showed normal cranial nerves. Movements of the eyes, reaction of the pupils and fundi were normal. Visual function of the right eye was absolutely intact; a characteristic impairment was, however, found in her left eye. In the beginning the patient saw with her left eye as she did with the right one, but she soon stated that vision became darkened. This darkening occurred regularly in the right outer sector of the left eye and spread very quickly over the whole eye so that the patient was in fact not able to see with her left eye any more. Examination of the field of vision gave normal results in the right eye, while in the left eye it narrowed rapidly starting from the outer side till total darkening in the left eye occurred. Otological examination revealed perforation of the membrane in the left ear caused by a healed otitis media, and reduced hearing in this ear. X-ray of the skull and the electroencephalogram gave normal results.

Motility, tonus and power in all the extremities were normal as were the reflexes. Superficial and deep sensibility, stereognosis included, was completely intact. This patient showed, however, a systematized *disequilibrium* on the *left* side which presented the features of the *sensorimotor induction syndrome* and which will be described in detail below.

B. Special examination of the induced sensorimotor manifestations

a. Features of the left-sided disequilibrium. The patient kept her head *inclined* spontaneously to the *left*. When she was asked to place her head in the midline, after it had been turned passively to the right and left, she always put it back inclined slightly to the left. When both eyes were shut, inclination of the head to the left increased markedly while at the same time the whole body inclined to the left.

FIG. 5

FIG. 6

When the patient, with her eyes shut, was asked to stretch out first her right and then her left arm and to keep them in this position, she could do so with her right arm, but the *left* arm began to *descend* at once and to

deviate markedly *outward*, accompanied by an increasing inclination of the whole body. The patient was not aware of these changes. At the same time her *head* turned *automatically* and strongly to the *left*, while her eyes deviated to the same side. When her head started to turn to the left, the patient regularly became *unconscious* and remained so until her head reached the extreme left, whereafter this condition subsided spontaneously. During this state the patient was not aware of the fact that she was spoken to or what had happened to her. The same proceedings occurred when the patient was asked to raise her left leg and to keep it in this position. The leg descended and deviated outward, while the automatic turning of the head to the left started at the same time, accompanied by the phenomena described above. When her left arm and leg were raised simultaneously, the turning of the head to the left occurred more quickly and powerfully with the descent and deviation of these extremities, while the whole body turned to the left as well. When the test was performed with the extremities on the right, this effect was not obtained.

When these tests were carried out after alternately closing the right and then the left eye, the same change in the position of the left arm and the automatic turning of the head to the left were observed on closure of the right eye as on closure of both eyes (fig. 5). When the left eye was shut, there appeared only a slight descent of the left arm, but turning of the head with loss of consciousness did not occur (fig. 6).

When the patient performed the finger-nose test and localized the midline of her body, she did it correctly with her right hand, while she regularly past-pointed outward to the left with her left hand. The same past-pointing outward to the left with her left hand was also observed when she tried to touch external objects. This impairment of localization was apparent also in the left leg. When performing the heel to knee test or trying to reach with her big toe the finger of the examiner held above her leg, she always deviated outward to the left. With her right leg she performed these tests correctly. When standing or walking with her eyes open, no spontaneous disturbances were observed. However, when standing with her eyes shut, a tendency to *fall* to the *left* became apparent immediately. When the right eye only was closed, the same tendency to fall appeared as on closure of both eyes. However, when the left eye was shut, there was no change at all. When the patient was asked to go forward and backward with her eyes shut, the soon deviated to the left. The same deviasion to the left appeared also when she walked backward with her eyes shut. A zigzag walk resulted when she was asked to go back and forward several times with her eyes closed.

b. Perceptual disturbances in haptic and tactile spheres. When the patient, with her eyes shut, was asked to place a rod vertically, she always held it with its lower end inclined to the left (fig. 7). When asked to place the rod horizontally, she inclined it with its left end downward (fig. 8). The degree of inclination in the horizontal plane was three times more than that of the vertical plane. When a small rod was placed alternately on the right and then on the left side of the patient's chest, she felt its position correctly on the right side, but on the left side she perceived the vertical rod inclined with its lower end to the left and the horizontal rod with its left end inclined downward. The rim of a glass was correctly appreciated on the right side of her chest, but on the left side she only felt the right half of the rim correctly, while she was unaware altogether of the left half. When this test was done repeatedly in the same position, the rim

FIG. 7

FIG. 8

of the glass was not felt at all. The faulty tactile perception of the coordinates and of objects became worse and more evident with the increasing inclination of the body to the left. When the same tests were performed on alternately closing the right and then the left eye, the same result was obtained on closure of the right eye as on closure of both eyes, while on closure of the left eye only, the faulty perception was not found any more and the spontaneous inclination of the body to the left disappeared too.

When two wooden cubes of the same size and weight were placed in each hand, with her eyes shut, the patient felt the one in her *left* hand as being *bigger*. When she closed the right eye only, the same impression was obtained as on closure of both eyes. When the same test was performed with her eyes open but her hands covered, to exclude vision, the cube in her left hand again seemed to be bigger than that in her right hand although not so much as before. During the performance of this test a slight deviation of the eyes to the left was observed. When the *left* eye was *closed*, the objects were *correctly* perceived. The same results were also obtained with regard to perception of weight. The objects in her left hand seemed not only to be bigger but also heavier, and perception of weight was influenced in the same way as that of size.

c. Disturbances of visual perception. The patient, who had had no disturbances whatsoever concerning visual orientation in space, stated that during these last 6 months she had had severe difficulties when reading, so that she had to give it up altogether of late. When she was asked to read some text, it became apparent that she could read only 2–3 lines and then could not continue as her vision became obscured and everything disappeared from sight. Thorough examination with each eye revealed that she could read well when using her right eye, and only after reading 10–12 lines did she ask to rest as her vision started to become darkened. When the patient was asked to read *using* her *left* eye, she was hardly able to finish the first line as the left part of her field of vision became obscured at once, and on continued fixation everything became black. When reading English she only perceived the right half of the line well, and when reading Hebrew, from right to left, she could not see the left part of the line properly and, therefore, read only the right half of it. It must be mentioned that during the test the patient's head and eyes deviated slightly and the body inclined increasingly to the left.

When seeing with her right eye only, the patient perceived the coordinates of space correctly, but when using both eyes, she perceived a vertical line with its upper end inclined to the right. A horizontal line was perceived with its left end inclined downward. The angle of deviation on repeated tests was 5°–8°. This disturbed perception was much more evident in the left eye where the angle of deviation amounted to 12°–16°. When the patient was asked to draw figures of the same size alternately using her right and then her left eye, those drawn using her left eye only regularly turned out larger. Another difference between both eyes concerned perception of dotted lines. While these were perceived correctly with the right eye, they were seen as being continuous when using the left eye, when the intervals between the dots were less than 1½–2 mm. When these tests were performed using her left eye, while the right eye was open but separated by a partition, all perceptual

disturbances described above were significantly reduced.

Color perception tested with woollen samples was correct when the patient used her right eye, but when she used her *left* eye, the *colors* seemed to be *blurred*. This disturbance concerned dark colors especially which appeared to be equally black, while red and its shades seemed less changed. It became apparent further on repeated testing that the disturbed color perception concerned chiefly the left outer sector of the field of vision and increased gradually on continued vision.

d. Influence of colors on the pathological phenomena. In view of the corrective effect of the contralateral right eye on the spontaneous postural and sensory disturbances, the influence of colors on these disturbances was also examined in this case. The postural attitude of the patient when using her right eye only served as a basis and point of comparison. In this position the patient's body and head remained straight and the left arm descended for about 10 cm only. The tests were performed with the colors of the Wratten filter which were put before her right eye, while the left eye remained shut. Pure red of Wratten filter 24 was used first to which the patient assented unwillingly as she could not bear to look at red of late. She stated that she felt sick and suffered such severe attacks that she had carefully *avoided* putting on her *red dress* for the last half year. Examination revealed that this subjective feeling was in fact based on real causes, and this could also be demonstrated objectively. As soon as *red* was put before her *right* eye, an *increasing* inclination of the body to the left started, the left arm deviated strongly downward and outward, while at the same time a compulsive turning of the body to the left started accompanied by deviation of the head and the eyes to the left and loss of consciousness. When pure blue of Wratten filter 50 was put before the patient's right eye, no changes in her postural attitude were evoked. The patient remained sitting straight, and even the slight descent of the left arm which appeared when she used her right eye did not occur. The *corrective* effect of *blue* became still more evident after the postural changes caused by the red color were already in full motion. It was only necessary to replace the red color by blue in order to interrupt the inclination of the body downward to the left and to cause a gradual return movement of the body and the left arm until a normal position was reached. It must be mentioned that the patient, who felt unwell under the influence of red and showed accelerated breathing and palpitations, felt absolutely well when given the blue color. In view of the striking contrary effects of red and blue the effects of the other mixed spectral colors were examined by means of Wratten filters. It became apparent that the degree of the deteriorating subjective and objective effect depended on the smaller or greater content of red in the mixed colors and that this effect became less evident the more pure blue was contained in them. This color effect influenced the unilateral postural as well as the homolateral sensory disturbances.

e. Acoustic discomfort and optic function. Tests performed by audiometric methods to determine whether sound influenced postural conditions in analogy to the color effect showed no change. It was seen, however, that on increase of intensity until the threshold of discomfort was reached, a deterioration of the postural disturbances resulted. Also in this case the threshold of discomfort could be influenced regularly by optic function and color effect. The patient was very sensitive with regard to the threshold of discomfort in all frequencies, even when both eyes were open. The threshold was then between 40 and 60 db. for the right ear and between 50 and 90 db. for the left ear. If one considers that hearing in the left ear was diminished to 55–80 db., it is apparent that the threshold of discomfort coincided in fact with that of hearing and was even more sensitive than in the right ear. It is of interest to note that the alternate closure of each eye gave constant results. When the right eye was closed while the left eye on the disequilibrated side remained open, the threshold of discomfort was very low and lay between 35–55 db. for the right ear and between 55–70 db. for the left ear. However, when the left eye was closed while the contralateral right eye remained open, the threshold of discomfort was raised to 60–85 db. for the right ear and above 100 db. in most frequencies for the left ear. When a red glass was put before the right eye, marked lowering of the threshold of discomfort resulted together with the onset of

disturbances of body posture described above. The threshold of discomfort lay now for the frequencies of 1,000–4,000, between 35–40 db. in the right ear and 60–65 db. for the frequencies of 1,000–1,500 respectively in the left ear. Thorough examination could not be performed as loss of consciousness occurred very quickly under the influence of red. The corrective effect of blue on this sensation was in this case not so distinct as the deteriorating effect of red.

Comment and Conclusions

Both cases discussed above presented the symptomatology of the sensorimotor induction syndrome (4–7, 21). As far as is known at present this syndrome is composed of the following symptoms: 1) motor disturbances resulting in a unilateral postural deviation of the whole body and its ipsilateral extremities; 2) monocular or even binocular impairment of the visual perception of spatial coordinates and of geometrical figures; 3) monocular micropsia or macropsia; 4) monocular or even binocular dissolution of color perception; 5) change in the size of written script and displacement of the line of writing; 6) disturbed discrimination of spatially close optic stimuli; 7) deviation in the tactile and haptic perception of the vertical and the horizontal; 8) unilateral acoustic deviation from the midline outward of a sound transmitted to both ears; 9) change in the tactile perception of size of objects, resulting in unilateral microstereognosis or macrostereognosis; 10) unilateral faulty estimation of weights and distances; 11) unilateral disturbed discrimination of closely spaced tactile stimuli; 12) unilateral diminution of the sense of vibration; 13) extensive mutual influence of motor and sensory functions. As has been pointed out before elsewhere these seemingly unrelated symptoms can be traced back to common basic disturbances by a differentiation between primary and secondary symptoms.

To the primary symptoms of the sensory motor induction syndrome belong the phenomena of unilateral deviation, which manifest themselves systematically in the motor and sensory spheres on the same side of the body, the motor disturbances constituting the preliminary condition of the syndrome. These phenomena are the basic symptoms because by their equal inductive effect they represent the characteristic features of the syndrome and are in fact its constant components. All the disturbances mentioned above were found in both patients; in the first patient on the right and in the second patient on the left side of the body. The unilateral disequilibrium manifested itself in both patients as a tendency to fall to the affected side, as a deviation of gait to the homolateral side and as a deviation of the homolateral extremities downward and outward, all unknown to the patients. A characteristic feature of the syndrome of sensorimotor induction is the fact that this displacement of the statokinetic system of the body causes inductively a deviation in the sensory perception of the vertical and horizontal coordinates in the visual, haptic, tactile and sometimes also in the acoustic spheres, and that this sensory deviation manifests itself characteristically on that side of the body which corresponds with the side of disequilibrium. As will be remembered, this induced sensory deviation in the perception of the coordinates was also found in these patients, manifesting itself in visual, tactile and haptic spheres on the affected side of the body. The optic deviation of the horizontal caused also in the first patient a deviation of the line of writing when she used her right eye only.

In contrast to these constant primary sensorimotor symptoms, the *inconstant* secondary symptoms concern only the *sensory* functions. As has been demonstrated the disorganization of statokinetic stability, which manifests itself in the primary symptoms of sensorimotor deviation, can under certain circumstances effect a qualitative dedifferentiation and a quantitative changed perception of the sensory stimuli. The resulting sensory disturbances are called "secondary disturbances of perception" (6) as they appear despite the integrity of the sensory organs and are phenomenologically entirely different. Of secondary sensory phenomena which are based on the *qualitative* dedifferentiation of sensory perception, the symptoms of impaired discrimination of tactile and visual stimuli, including the perception of colors, of weight differences and of fine vibratory stimuli, must be mentioned. In addition to these phenomena belong the symptoms of *quantitative* changes of perception which manifest themselves as micropsia or macropsia, microstereognosis or

macrostereognosis. These secondary sensory disturbances were found almost without exception in both patients and manifested themselves regularly on *that side* of the body which *corresponded* with the side of the *disequilibrium*. In the first patient with right-sided disequilibrium macropsia was found as well as a coarsened perception of colors and of spatially close optic stimuli when using her right eye, and at the same time macrostereognosis and an overestimation of weight were found in the right hand. In the second patient with left-sided disequilibrium exactly the same sensory disturbances as above, but on the opposite side, were noted when she used her left eye. While these findings belong to the already known features of the syndrome and confirm earlier experiences, these patients presented some new features which are able to broaden and deepen our knowledge of these phenomena. These features concern chiefly visual perception and confirm a finding (5) made in another patient suffering from left-sided disequilibrium who presented a difference in visual perception between the outer and inner sectors of the left field of vision. This became apparent from the fact that the upper and middle parts of a dotted line which lay in the outer sector of the eye were perceived as being continuous, while its lower part which extended beyond this zone was correctly perceived. Further, it became apparent that color dissolution did not extend equally over the whole left eye, but affected chiefly its left outer sector. This later finding was also found in both patients discussed in this paper, where this disturbance showed itself most severely in the outer sectors of the eyes. When the second patient used her left eye only, darkening set in very quickly in the left outer sector of the field of vision. To the first patient, on prolonged looking at a cube with her right eye, its right outer part seemed to be larger and thicker. Of basic significance is the fact that this patient felt the same enlargement and thickening of the right outer edge of a cube when touching it with her right hand. This finding of unequal dedifferentiation in the same sensory organ seems to be of special interest. The fact that the greatest degree of impairment was found in the extreme outer sensory field, which is situated functionally nearer to the effect of motor deviation, confirms the close connection of these sensory proceedings with the homolaterally disturbed body posture. The fact that unequal qualitative dedifferentiation was also found in visual and tactile perception on the same side confirms in addition the existence of a general fundamental tendency.

Both patients presented moreover some new interesting features, all of which belong to the phenomenology of the mutual influence of motor and sensory functions (7–13). This phenomenon which is one of the most interesting symptomatological features of the sensorimotor induction syndrome shows itself in many ways.

This mutual influence takes place chiefly in the motor sphere and becomes most apparent in the relation between head posture and posture of the extremities. The influence of head posture is of main importance and is encountered most frequently, but in contrast an influence of the extremities on head posture is very rarely met with. These two forms of mutual influence were also found in both patients. In the first patient with right-sided disequilibrium, turning of the head to the right resulted in a reduction and retardation of displacement of the extremities on the right, while by turning the head to the left, displacement of the extremities was accelerated and aggravated. In the second patient with disequilibrium on the left, the position of the left extremities was not influenced at all by changed head posture. However, changed position of the extremities on the left caused an impressive change of head posture. When, with her eyes shut, the left arm or leg or both together began to deviate outward and downward to the left, an *automatic* turning of the head to the left appeared, unknown to the patient, accompanied by deviation of the eyes to the left and loss of consciousness.

The fact that by automatic turning of the head loss of consciousness could regularly be provoked in the second patient is of special interest in many respects. The spontaneous convulsive attacks should be kept in mind here as they presented the same features and were composed of several well-known neuropathological components. These attacks began with a raising of the left arm and a convulsive automatic turning of the head and eyes to the left. This conjugate deviation of the head and eyes, which movement originates in the mesencephalon according to clinical experi-

ence and the experimental work of Hess (14) and the anatomical control studies by Minkowski (17), was followed by cerebellar opistotonus and finally by a generalized tonic extension spasm which presented the picture of decerebrate rigidity. It must be stressed that these convulsions with loss of consciousness were mostly preceded by spontaneous raising of the left arm and by conjugate deviation of the head and eyes to the left. This introductory first phase of the spontaneous attacks corresponds phenomenologically with automatic deviation of the head and eyes to the left, with loss of consciousness following intentional raising of the left arm. The provoked attacks can therefore be regarded as the physiopathological link between them and the spontaneous attacks.

This fact deserves to be noticed all the more as it reveals the special nature of these attacks. It is common knowledge that spontaneous attacks of unilateral conjugate deviation of the head and eyes with loss of consciousness occur also in epilepsy. It must be mentioned that electroencephalography in this patient revealed no signs of epileptic activity either on spontaneous or on provoked attacks. They are therefore unique in their type as they are caused *solely* by unilateral disequilibrium and are closely connected with this *basic* impairment. The attacks observed by Zingerle (23) in the framework of his "Automatosesyndrome" and to some extent also those of turning of the head and body with visual hallucinations described by de Morsier (18) must be mentioned here. Unilateral disequilibrium cannot only blur the distinct separateness of the single functions, causing thereby the described phenomena of mutual influence, but occasionally may affect deeper lying mechanisms too. The special nature of these attacks is based on the extensive disintegration of these kinetic automatisms as a result of unilateral disequilibrium. After stabilization of the equilibrium these attacks, like the phenomenon of mutual influence of the various functions, disappear gradually or are abolished altogether. In this patient, too, after the left-sided disequilibrium had receded to a large extent, attacks of turning of the head and loss of consciousness could no longer be provoked. In contrast to the distinct character of the attacks at the height of the disease, the now diminished deviation of the left arm caused only slight turning of the head without loss of consciousness. The patient's statement that her spontaneous attacks had decreased lately in appearance and power were in accordance with these findings.

The new symptom of spontaneous and induced spasmatic attacks with loss of consciousness enlarges therefore the symptomatology of the sensorimotor induction syndrome. The mechanism underlying these attacks presents a physiological analogy to the secondary disturbances of perception which are sensory changes of a special kind. They represent the induced secondary effects caused by the primary unilateral disturbances of the disequilibrium and appear despite the integrity of the sensory organs. It becomes apparent that the unilateral disturbances of body posture induce not only a change in the single functions of sensory perception, but effect in the same way secondary disturbances of the sensorium and consciousness despite a primarily intact brain.

To the same sphere of mutual influence of motor and sensory functions belongs also the influence of optic function on postural attitude (13). The necessity for bilateral closure of the eyes on performance of the Romberg test and on examination of the disequilibration of the single extremities is common knowledge and generally used. When this test was modified in such a way that the eyes were shut separately, patients with the sensorimotor induction syndrome showed a divergent reaction. When the patient used that eye which corresponded with the side of the disequilibrium, the same basic pathological tendency to fall and the same displacement of the homolateral extremities resulted as on closure of both eyes although occasionally diminished and nearly always retarded. However, when the patient used that eye which was opposed to the side of disequilibrium, the unilateral tendency to fall was entirely abolished and the displacement of the extremities was reduced or eliminated. This divergent attitude can be explained well by the neurodynamic mechanism underlying the sensorimotor induction syndrome. The unchanged persistence of the unilateral disequilibrium on vision with that eye which corresponds to the side of the disequilibrium is based on the characteristic visual deviation in

the perception of space, which manifests itself regularly in this eye. The positive corrective influence of the contralateral eye on the disturbances caused by the unilateral disequilibrium belongs, however, to the sphere of mutual influence of motor and sensory functions and represents an example of the influence of a sensory stimulus on motor function. One may refer to the special influence of a light stimulus on motor deviation observed by Metzger (16) in 1931. He found that illumination of one eye caused a homolateral reaction to fall with past-pointing. The optic influence on body posture which Magnus (15) observed in his classic animal experiments may be mentioned too. This optic influence was distinctly apparent in the patients described above. In both patients the tendency to fall was abolished, and deviation of the affected extremities reduced when the contralateral eye was used. In the second patient, turning of the head to the left and the resulting loss of consciousness which appeared when both eyes or the right eye only was closed disappeared entirely when the left eye was closed and the right contralateral eye only was used. The tests performed with these patients confirmed not only the effect of optic function on motor disturbances of body posture but proved that the corrective effect of the contralateral eye extended to the secondary sensory disturbances too. This effect concerned the visual and tactile functions and manifested itself differently in these patients. The angle of deviation in the visual perception of a vertical line with the homolateral eye was visibly reduced when the contralateral eye, although separated by a screen, remained open. The coarsened discrimination in the visual perception with the homolateral eye of a dotted line diminished visibly when the contralateral eye was kept open. In the first patient the alterations which appeared when she was drawing geometrical figures, using her right eye only, disappeared when the contralateral left eye was kept open. In the tactile sphere this effect influenced the faulty perception of tactile stimuli on the homolateral side of the body and also overestimation of size and weight in the homolateral hand. All these deviations did not appear when the contralateral eye was kept open. The optic effect on the sensory disturbances described above should not produce the impression that we are dealing here with a direct influence of a stimulus in one sensory sphere on the functions of another sensory sphere. My observations have shown that the influence on the secondary sensory disturbances became effective by means of body posture. The optic effect of the contralateral eye corrected *primarily* the unilateral disequilibrium and then *indirectly* the secondary *sensory disturbances*. The significance of body posture with respect to sensory perception was further confirmed by the examination on color effect as will be shown below.

In both patients the effect of *colors* on the unilateral disequilibrium manifested itself very impressively. As will be recalled on using the contralateral eye the postural pattern only served as a basis and point of comparison. In this position the body of the seated patients was slightly inclined and the homolateral arm deviated moderately. Systematic tests on the influence of various colors by means of Wratten filters on this postural pattern, when using the contralateral eye, resulted in an unvarying attitude of both patients. Pure red produced a definite worsening effect on the postural pattern while pure blue had a marked ameliorating effect on the existing disturbances. When red was put before the contralateral eye of the first patient, a dramatic change in her postural pattern took place. The inclination of the body to the right and deviation of the right arm downward to the right increased constantly with violent rocking movements till the patient fell to the right. In the second patient with the left-sided disequilibrium red produced the same changes effecting an inclination of the body to the left and deviation of the left arm downward to the left with the addition of automatic turning of the head to the left and loss of consciousness. In contrast pure blue had a wholly corrective influence on the postural pattern of both patients in that the primarily one-sided inclination of the body and the homolateral deviation of the arm disappeared until an entirely normal position was attained. As will be recalled, blue even stopped and reversed the pathological movements provoked by red. It was then revealed that body posture reacted to colors even more sensitively than the eye. While the eye perceived two kinds of blue as being really blue, body posture reacted differently. While one blue had an ameliorating

effect, the other provoked the pathological movements. It was revealed that this latter blue, when examined by spectral analysis, had an admixture of red which was not perceived by the eye. Between this extreme contrary effect of red and blue lay the other colors, the effect of which depended on the admixture and degree of contents of red and blue. The colors red, yellow, green and blue and their mixed nuances represent the order of succession in their effect from bad to good on the postural pattern. The effect of these colors did not only concern the motor phenomena of disequilibration but accordingly also the secondary sensory phenomena. The unvarying influence of these colors on acoustic discomfort, by lowering and raising of its threshold, must be mentioned in this connection. These tests on color effect confirmed too that this influence was exerted primarily through the effect on body posture, and the sensory phenomena were influenced only indirectly in the same sense.

Metzger when investigating the effect of light on rabbits and men stressed the effect of colored lights. Goldstein and Rosenthal (3) were the first to determine the effect of colors on cerebellar patients, while Quadfasel and Krayenbühl (19, 20) examined the effect of colors on spastic torticollis. In cerebellar patients the pathological tendency of deviation of the arm served as the indicator. The patients were asked to look at a colored screen. The different colors caused a different degree of deviation of the arm. Under the influence of red the arm deviated most strongly, somewhat less under that of yellow, still less under the influence of blue, and least under that of green. My results agree with these findings only with respect to the sequence red and yellow, but they *differ* in the sequence blue and green in that the best effect was produced by blue. In my patients, where the biologic effect of colors was tested with regard to the deviation of the arm as well as to the inclination of the body, the effect of colors on the subjective feeling of the patients became apparent too. Without being aware of the resulting postural changes the patients felt very bad when looking at red, a feeling which was accompanied by nausea, pallor, accelerated pulse and breathing. However, under the influence of blue the patient felt extremely well.

This effect of blue on the correction of the postural disturbances was now evaluated therapeutically. The homolateral eye was closed, and blue spectacles were put before the contralateral eye. The expected therapeutic effect took place: the patients felt better subjectively and a visible amelioration of the disturbed functions occurred. In the second patient, after prolonged use of the blue spectacles, the spontaneous spasmatic attacks gradually disappeared too.

As has been discussed elsewhere, in dissolution of color perception, which is found in the homolateral eye of patients with the sensorimotor induction syndrome, the perception of various shades of blue was most impaired. These were perceived as being dark or even black, while perception of red was preserved best. This finding was also confirmed without exception in these two patients as well as in all other patients of this kind. This extraordinary position of red in the secondary dissolution of color perception is of special interest as it is fundamentally contrary to the position of red in color dissolution caused by an anatomical lesion of the optic nerve, where red disappears first. Therefore, it is worth mentioning that red, which from the biologic point of view is preserved best, had subjectively and objectively the most annoying and disturbing effect.

In contrast to the remarkable influence of optic stimuli on postural attitude, no influence of sound on the existing conditions was noted in either patient. This fact is certainly based on the more dominant position and deeper integration of the optic functions in the neurobiologic organization of the organism as compared with the other sensory functions. The same feature is obtained in the sphere of electrical activity of the brain, where photic stimulation activates the pathological tendencies much more frequently and more strongly than acoustic stimuli.

Conclusive Remarks

The sensorimotor induction syndrome in unilateral disequilibrium represents clinically a well-defined entity which should be observed carefully. Knowledge of the abundant symptomatology is a preliminary condition for the recognition of the picture of the disease which occurs more frequently than is generally supposed and should not be neglected any longer.

But apart from the significance of this syndrome for clinical practice the underlying neurobiological mechanisms open up interesting theoretical aspects. The significance of postural functioning with regard to sensory perception revealed here should be recalled as well as the special phenomenology and dynamics of the secondary, in contrast to the generally known primary disturbances of perception caused by lesions of the sensory organs themselves. Further the abundant phenomenology of the mutual influence of various functions should be mentioned in this connection. However, in order to understand these proceedings correctly it is necessary to know from the first that they take effect in a *secluded separate functional system* and obey rules of their own which are entirely *different* from the principles of activity valid for the pyramidal or the sensory system. The functional rules of these systems cannot by any means be applied to the theory and practice of sensorimotor induction as, on the other hand, the functional rules of this system cannot be generalized. The facts and findings revealed above justify decidedly placing the little noticed equilibratory system in a line with the most important human nervous systems. In this connection the consecutive stratification of the function and the substratum of the equilibrium in the ascending line of evolution should be recalled as well as the extraordinarily complicated conditions on which, as Magnus and his pupils demonstrated, regulation of body posture is based. With regard to localization, the disclosure made by them of the relation of the various reflexes of body posture to the cervical cord, the brainstem, mesencephalon and nucleus ruber indicates the participation of additional anatomical areas in the regulation of the equilibrium. Further mention should be made of the special tasks of the human equilibratory system with respect to the erection of the human body and the liberation of the human hand from a supporting extremity to a creative organ in connection with the phylogenetic and ontogenetic development of the human frontal brain. Through this successive functional stratification it can be explained easily that the human equilibratory system is not based on uninterrupted long tracts but on the uniform and purposive cooperation of several relay connections, one interlocking with the other. As is well known, this system includes the vestibular nerve which is connected with the cerebellum via the vestibulocerebellar tract and by means of its nuclei also with the spinal cord and the midbrain. In addition there are reciprocal corticopontocerebellar connections and among them with some parts of the contralateral frontal brain. In this system, the nature of which has only been dealt with in a general way, the cerebellum seems to occupy a central position. Of special interest in this connection and particularly with regard to the symptomatology and localization of the sensorimotor induction syndrome are the electroanatomic studies of Snider (22) and his co-workers who discovered visual, tactile and auditory areas in the cerebellum. As a result of these investigations, Snider stated that the cerebellum acts both in motor and sensory spheres, and that these sensory spheres do not subserve any known conscious function. On the basis of these findings, Snider demands a new and broader concept of cerebellar function and even states that workers in this field have been entirely too lethargic about recognizing this sensory action. As will be recalled, Snider's findings, obtained by electroanatomic means, correspond very well with our clinical investigations on primary sensorimotor symptoms of deviation, which manifest themselves in the motor, visual, tactile, haptic and acoustic spheres, unknown to the individual. These new electroanatomic findings can, therefore, add support to the anatomic and physiologic foundation of the syndrome of sensorimotor induction.

I wish to express my gratitude to Dr. E. Alexander, Head of the Department of Experimental Physics of the Hebrew University, and Dr. B. Fraenkel, Assistant of the Department, for their advice in the carrying out of the colour tests. I also wish to thank Dr. M. Feinmesser, acting Head of our Otolaryngological Department, and Mrs. L. Tell-Bauberger and Miss S. Bilski for their help in the audiometric testing.

BIBLIOGRAPHY

1. Goldstein, K.: Ueber induzierte Tonusveraenderungen. *Klin. Wchnschr., 7:* 293, 1925.
2. Goldstein, K., and Jablonski, W.: Ueber den Einfluss des Tonus auf Refraktion und Sehleistungen. *v. Graefes Arch. Ophth., 130:* 395, 1933.
3. Goldstein, K., and Rosenthal, O.: Zum Problem der Wirkung der Farben auf den Organismus. *Schweiz. Arch. f. Neurol. u. Psychiat., 26:* 3, 1930.
4. Halpern, L.: Syndrome of sensorimotor induction

in disturbed equilibrium. *Arch. Neurol. & Psychiat.*, *62:* 330, 1949.
5. Halpern, L.: Syndrome of sensorimotor induction in combined cerebellar and labyrinthine injury. *J. Nerv. & Ment. Dis.*, *114:* 137, 1951.
6. Halpern, L.: Le syndrome d'induction sensorimotrice dans les troubles de l'équilibre. Paris: Masson et Cie, 1951.
7. Halpern, L., and Kidron, D. P.: Sensorimotor induction syndrome in unilateral disequilibrium. *Neurology, 4:* 233, 1954.
8. Halpern, L.: Secondary disturbances of perception. *J. Nerv. & Ment. Dis.*, *116:* 783, 1952.
9. Halpern, L., and Landau, J.: Head posture and visual functions. *Monatsschr. Psychiat. u. Neurol.*, *125:* 148, 1953.
10. Halpern, L., and Feinmesser, M.: Head posture and acoustic perception. *Monatsschr. Psychiat. u. Neurol.*, *127:* 122, 1954.
11. Halpern, L.: Head posture and sensory perception. Fifth International Congress of Neurology, Lisbon, 1953.
12. Halpern, L.: Biological significance of head posture in unilateral disequilibrium. *Arch. Neurol. & Psychiat.*, *72:* 160, 1954.
13. Halpern, L.: Optic function and postural attitude. *Neurology, 4:* 831, 1954.
14. Hess, R. W.: *Das Zwischenhirn.* Basel: Benno Schwabe Verlag, 1949.
15. Magnus, R.: *Koerperstellung.* Berlin, 1924.
16. Metzger, E.: Experimentelle Untersuchungen ueber den Lichttonus des Menschen und des Kaninchens. *v. Graefes Arch. Ophth.*, *127:* 296, 1931.
17. Minkowski, M.: Zur Kenntnis des Verlaufs, der Verbindungen und des Aufbaus der extrapyramidalen Bahnen, besonders in ihren Beziehungen zum Vestibularapparat, im Zusammenhang mit physiologischen Versuchen von R. W. Hess. *Schweiz. Arch. f. Neurol. u. Psychiat.*, *51:* 99, 1943.
18. de Morsier, G.: Le syndrome vestibulo-visuel parietal d'origine traumatique. l'Encephale, 1937.
19. Quadfasel, F. A.: Statische Haltungsstoerung und intermodale Wahrenehmungsstoerungen in ihrer gegenseitigen Abhaengigkeit and Beeinflussbarkeit. *Monatsschr. Psychiat. u. Neurol.*, *96:* 326; *97:* 90, 1936.
20. Quadfasel, F. A., and Krayenbühl, H.: Ueber Haltungsstoerungen und ihre Beeinflussbarkeit. *Monatsschr. f. Psychiat. u. Neurol.*, *88:* 39, 1934.
21. Rozanski, J.: Contribution a l'etude du syndrome d'induction sensorimotrice. *Arch. Suiss. Neurol.*, *69:* 248, 1952.
22. Snider, R. S.: Recent contributions to the anatomy and physiology of the cerebellum. *Arch. Neurol. & Psychiat.*, *64:* 196, 1950.
23. Zingerle, H.: Automatosesyndrom bei linksseitiger Stirnhirnerkrankung. *Zeitschr. f. d. ges. Neurol. u. Psychiat.*, *145:* 249, 1933.

PLEASURE

Preliminary Report of an Investigation

BRUCE BUCHENHOLZ, M.D.[1]

Our scientific knowledge of emotional function was developed almost entirely within the context of pathology and under the pressure of the practical need to relieve suffering. Since Freud, basic exploration of the field has necessarily focused on the distortions resulting from fear, guilt, and rage. Theoretical reconstructions of "normal" functioning have, therefore, been devised chiefly from the empirical data of therapeutic experience.

That perspective has so stressed the "emergency emotions"[2] that tremendous areas of vital emotional function have been virtually ignored. This investigation proposes to exploit the obverse perspective, hoping to expand the body of knowledge by approaching it from the standpoint of the "welfare emotions".[3] Although their significance for both the individual (4, 6) and society (5) has been recognized, they have been explored only within the framework of malfunction, which is essentially an indirect approach.

The state-of-being most intimately connected with the "welfare emotions" is happiness. I have, therefore, started with a consideration of happiness. If happiness is accepted, even though only tacitly, as a state which magically appears when *un*happiness is relieved, then the pragmatic emphasis must be on unhappiness or the relief of it. And so it has been. The emphasis in this investigation is on approaching the study of happiness directly, rather than taking it for granted as a "somehow thing".

For millennia, happiness has been the professional concern of philosophers, and the practical concern of all men. Despite this fact, I was unable to find experimental or investigative information about its specific relationship to individual emotional functioning. There is a mass of speculation and hypothesis, but no "knowledge". We don't even "know" what happiness is. There is no successfully-tested specific formulation. The starting point of the investigation must, therefore, be a clear definition of what is being investigated, and the first problem: "What is happiness?".

Since "the whole of science is nothing more than a refinement of every-day thinking" (2), the first step is to get a rough estimate of the common-sense understanding of the subject. This resides less in what people say they think about the concept than in how they use it. In order to get some picture of this, six people were brought together without being told the purpose of the meeting. The criteria for selection were that they be laymen in the field of human emotions and behavior, be generally considered as having above average intelligence, and have a good capacity for verbalization. A discussion was started by asking them if they knew any happy people. The conversation was encouraged along directions that might indicate how these people used the concept of happiness and how they felt about the various pertinent issues that arose.

This discussion was recorded, transcribed, and analyzed. The analysis consisted of extracting from the transcript those remarks that had direct bearing on the subject, eliminating the moderator's explanations and repetitions, and grouping the pertinent statements according to the themes they expressed. Here, as an example, is a group of statements which, taken from different parts of the discussion, clustered about a central theme:

"L: A youngster might want a printing press . . . enjoy it for a very short period, and then will want something else. . . . The pleasure of getting it is very keen and really very great, but the point that I'm trying to make is that it doesn't stay long. If it were a joy or a pleasure that had a longer period of attachment to the individual, then fine! . . .

[1] Psychoanalytic Clinic for Training and Research, Columbia University, New York City.

[2] "Emergency emotions" are those which serve the organism in the context of danger. Essentially fear and rage, the designation also encompasses derivatives and modifications of these, such as guilty fear, guilty rage, feelings of depression, etc. (7).

[3] "Welfare emotions" are the "positive", healthy forces that organize the individual's efforts towards a constructive life, and society's progress towards growth in cooperation. They are intimately connected with happiness and pleasure, and include such emotions as joy, love, and pride (7).

"N: . . . it's the continued, the extended feeling or combination or group of these feelings. . . .

"L: When the child wants a printing press, for example, he thinks that is going to give him a great deal more than it actually does. He soon finds out that it doesn't give him what he wants and so he is dissatisfied very quickly. . . .

"M: When you say 'a happy person', that automatically implies happy for more than a few seconds.

"N: I keep feeling that if you have a lot of pleasure—going back to the original question—you have sustained happiness. It's sort of a circle, one pleasure after another makes you happy. . . ."

These comments develop the theme of "sustained" pleasure. There was general agreement in the group that, for them, happiness is not a transient phenomenon, but a *feeling-state* with some quality of durability. The further implication is that the state of happiness is sustained by a series of experiences, each of which produces in the individual feelings of "pleasure" or "joy". The impression seems to be that there is a group of feelings, most often referred to in the discussion as "pleasure", which have this potential happiness-bringing quality by virtue of their *sufficient repetition*, providing the feeling-state with *adequate duration*.

When all of the themes were put together, there emerged a definition of this group's use of "happiness" as "the awareness, or awareness-readiness, of sufficiently *frequent*, *intense*, and *meaningful pleasure* experiences, for a period of *time*, within the *self or another person*." Although other groups might have developed other themes, these opened up such large areas for investigation that they were pursued further.

To make the transition from this commonsense usage to "scientific knowledge", the concepts (e.g., "pleasure") used by the group have to be defined more precisely, the qualifications (e.g., "sufficiently frequent") stated more explicitly, and all conclusions based on systematic controlled observation. Reviewing the group's definition with this in mind produced five major questions:

1. What is *pleasure?* A concept ("happiness") cannot be defined in terms of a substantive which is equally undefined.

2. What *frequency* and *duration* of pleasure feelings constitute a state of happiness?

3. What *intensity* is required for a pleasure experience to contribute to happiness?

4. What makes a particular pleasure-experience "*meaningful*" to the individual?

5. How is the experience communicated from one*self* to *another?*

Starting with the first question, "What is pleasure?", I found no answer which could be validated. Therefore, to arrive at a commonsense usage of the concept, the original procedure was repeated, utilizing the same group of people. Analysis of the discussion indicated that they used "pleasure" as a "communicable *feeling-state*, characterized by the general quality of agreeableness, and specific qualities dependent on its *source* and the receptivity of the *individual* experiencing it." The group spoke of the sources of pleasure experiences in terms of their *specificity* (e.g., "physical", "mental", "esthetic", etc.) and their relation to *reality* (e.g., "real" experience, fantasy, memory, etc.). They considered the individual in terms of *capacity* for pleasure, "*will*" to experience pleasure, and the underlying *mood* at the time of a pleasure experience. The analysis of this discussion, therefore, substituted six questions for the first of the five derived from the previous meeting:

A. 1. What are the *feelings* which people characterize as "pleasure"?

B. *Source.* 2. How does the *specificity* of the source influence the pleasure experience? 3. How does the *reality* (or unreality) of the source influence the pleasure experience?

C. *Individual.* 4. What is individual "pleasure *capacity*"? 5. How do *volitional* elements influence the pleasure experience? 6. What is the effect of predominant *mood* on pleasure experience?

Reviewing these 10 questions, it is apparent that the focal point is the feeling of pleasure itself,[4] what people feel when they experience pleasure. Not until we know the subjective experience of pleasure, what people mean when they speak of their pleasure, can we study the contributory factors or its role in human happiness (1).

The next step, therefore, was to ask people: "What do you feel when you feel pleasure?". This places the problem at the mercy of people's ability to recognize, inspect, and accurately describe their feelings. After studying the difficulties inherent in each of these procedures, two instruments were devised for ob-

[4] ". . . the concept owes its meaning and its justification exclusively to the totality of the sense impressions which we associate with it." A. Einstein (3).

taining the information. The first was a questionnaire explaining to the subject what was wanted, giving simple instructions in introspection, and asking for a written description of the feelings. The second, still being developed, was a drawing test, similar to the questionnaire but requesting the subject to draw the feeling (rather than to describe it in words). The rest of this report concerns itself with the questionnaire.[5]

The questionnaire consisted of three parts:

1. A letter enlisting the subject's cooperation:

Dear ————,

We would like to ask your help in an interesting scientific investigation. We need from you a little time and a little thought, which we believe you would consider well spent.

The investigation concerns the emotional experience of "pleasure," about which relatively little is known. We are gathering information, with the expectation of filling in some of the gaps in our knowledge. Would you, from your own experience, give us some of this information?

It means thinking of things one ordinarily doesn't concentrate on, asking yourself questions that may be very difficult to answer in words, taking a little time and effort away from your customary preoccupations. But we believe it will be rewarding for you, and it would surely be very helpful to us. Please try it, even if it seems difficult at first. Whatever you can contribute from your own experience, even just a few words, will be useful.

We are interested to find out how people know they're feeling pleasure, what are the sensations, the feelings which they call "pleasure." It's commonplace to ask: "Are you having a good time?" or "Are you enjoying yourself?" and one usually gets ready answers. Suppose we then asked: "Exactly how do you know?" That's our problem. Actually, most people know instantly when they're feeling pleasure. We want to know what it is they feel within themselves that tells them. We hope that if enough people will put enough effort into filling out the enclosed questionnaire, we will be able to analyze the pooled experience and derive some basic information about a basic emotional experience in life.

Please take a little time from your daily routine to learn something about yourself and tell us about it. Let us know if you have any questions about this.

2. Instructions:

1. Get off alone somewhere, get comfortable and physically relaxed. Think of some experiences which gave you a great deal of pleasure, fun, or satisfaction. Select one such experience and remember the good feelings you had. Concentrate on capturing the *feelings*. Try to describe in the greatest detail exactly what the feelings, sensations, etc. were. Close your eyes, turn your attention inward, concentrate on the *feeling* of pleasure, and then write on the questionnaire *everything* you notice, regardless of how trivial it may seem.

You may have trouble finding words, but don't be discouraged. Write *any* words that occur to you—tell what it was like or use any other way of explaining the feelings. Don't bother about the form or grammar or correctness of presentation. Just write what you can see, no matter how mixed-up it might seem. Although we would like it to be as complete as possible, *return it no matter how little you write.*

2. If, after a session of trying this something occurs to you that you've left out, or some new awareness, or something you've written seems wrong, *don't change* what you've originally written. Make your addition or correction separately.

3. If you can, please answer the second question. If the requirement of answering it would in any way interfere with a free and complete description of the experience, don't answer the question. If not, please do.

4. The information you give us will be used for research purposes, and the source will not be revealed. These papers may be left unsigned.

5. After you have written as much as you can in the questionnaire, please return it in the enclosed envelope.

3. Questions:

A. Think of an experience which gave you a lot of pleasure, joy, or delight. Concentrate on the feelings and, in the space below, write a description of the feelings (see instruction #1).

B. What was the experience you had in mind when you wrote the above description? (Remember—don't answer this if it will in any way prevent a full response to question A.)

C. Age:
(check) man____ woman____
(check) single____ married____ divorced____
separated____ widowed____
Children: (list by age and sex)

This form was tested by distributing it to 60 patients convalescing from medical and surgical illnesses. There were 30 returns, 15 of which were pertinent. The material was checked by discussion, singly and in groups, with some of the patients who answered the questionnaire.

In this small group of responses the subjective experiences described as "pleasure" had six sensory components. In most descriptions one component constituted the entire recollec-

[5] The techniques for developing and using these instruments were reviewed with Dr. Irving Lorge, Institute of Psychological Research, Teachers College, Columbia University.

Through the courtesy of Dr. M. R. Kaufman, Mt. Sinai Hospital, Dr. George W. Naumburg, Jr. distributed the questionnaires at the Neustadter Convalescent Home, Yonkers, New York. Dr. Naumburg also conducted the interviews with the respondents.

tion, in a few there were two or three. The sensations were:

1. A feeling of being drawn to and into the source, and of drawing it to and into the self: e.g., "I felt that nothing is better for me in that moment than breathing and looking and looking at those magnificent sceneries," and "Spellbound amidst its splendor, so absorbed in its depth, completely oblivious of everything. I seemed to touch its beauty."

2. A feeling of energy pressing for release. This includes a sense of exhilaration and excitement: e.g., "I wanted to do and do and do," and ". . . dancing in the street. Like a newborn human being."

3. A sensation of buoyancy: e.g., "You feel as if you float in air," and ". . . feeling light at heart."

4. Relaxation: e.g., "I felt relaxed and a sort of fulfillment," and "My body feels relaxed."

5. A feeling of softness and warmth: e.g., ". . . a very warm feeling of comfort," and "Soft and warm inside."

6. A sense of unreality. This was clear in only one questionnaire response: "I felt that I'm in a dream," but was also present in some interview responses.

The combinations noted were 1 and 6, 2 and 3, 4 and 5. That is, where the attraction between source and self, 1, is very intense, the progressive narrowing of awareness may have a concomitant element of unreality, 6. Similarly, the feeling of energy pressing for release, 2, sometimes occurs with the sense of buoyancy, 3. The most frequent combination is the feeling of relaxation, 4, together with the soft-warm feeling, 5. The relaxation-soft-warm constellation seems to have an enervating quality, in contrast to the energy-pressure-buoyancy constellation which is energizing. Subsequent data may alter the picture of these constellations and may present new ones. Possibly the energizing-enervating constellations represent sequential aspects of a total experience.

It is sometimes difficult to separate the sensory elements of pleasure from the subject's awareness of what might be more properly considered effects or concomitants. The respiratory changes are, for example, probably not specific to pleasure, yet are sometimes sufficiently pronounced to demand attention. "I was able to breathe freely" or "I stood there breathless" represent the respiratory aspect of a feeling of relief or a feeling of being overwhelmed, but not necessarily of the accompanying pleasure.

In terms of psychodynamic effects even this small sample hints at:

1. A relationship between pleasure and self-esteem. ("I felt relaxed and a sort of fulfillment and accomplishment.").

2. The tendency to interpret perceptions in such a way as to reinforce the pleasure. (". . . looks everything and everybody beautiful.").

3. The stimulation of a desire for repetition. ("I have on numbers of occasions since then tried to recapture those feelings.").

4. The motivating and energizing effects mentioned in the sensory context above. ("I was full of life and ambitions. . . .").

5. The enervating effect mentioned above, with a tendency to passivity. ("Utmost relaxation and feeling of complete fulfillment physically and mentally.").

6. The pressure to merge with the pleasure-source. (". . . absorbed in its depth."). This is an orienting effect, focusing awareness on the source of pleasure and impelling movement towards it.

Examples from the material reported here emphasize the security element: "Incidentally the smell of printer's ink on the Sunday comic sections gives me pleasure. I think back to my childhood when we would creep into my father's bed on a Sunday and have him read the 'Comic Supplement' to us. His protective presence in addition to the 'Comics' readings gave me a feeling of warmth and comfort." This constellation is most often experienced as softness, warmth inside, lightness, relaxation, comfort. Sometimes the warmth is actually felt as being "taken in" ("penetrate with warmth").

The returns were a test of our instrument. The results were described to indicate that the questionnaire produces useful information. This preliminary report indicates the scope of the project, the conceptual scheme, and the technique. Further discussion of the psychodynamic aspects must await collection and analysis of sufficient material.

On the basis of the trial experience described above, the questionnaire was improved

by a few minor changes in wording. About a thousand copies of the revised form will be distributed, and the information derived from these returns will be used to answer the question of what pleasure feels like (i.e., "What is pleasure?" in its subjective meaning). The test returns indicated, as shown above, that the material also lends itself to psychodynamic analysis and provides leads for further investigations into the pleasure mechanism. The results obtained from analysis of the material will be checked against a smaller sample of interviews. The drawing technique will be standardized, tested, and used in a similar manner. The other pertinent problems developed as outlined above will then be investigated in turn, and newly emergent leads will be followed.

Summary

Emphasis on study of emergency emotions has resulted in neglect of the role of the welfare emotions. This paper reports the initiation of a series of investigations designed to explore that role. The first of these is based on clarification and analysis of the subjective experience of pleasure. The conceptual scheme, development, and technique of the study are described.

Bibliography

1. Beebe-Center, J. G.: *The Psychology of Pleasantness and Unpleasantness.* (A review of the experiments of the classical introspectionist psychologists on the tangential subject of pleasantness-unpleasantness.) New York: D. Van Nostrand Co., 1932.
2. Einstein, Albert: Physics and reality. In *Out of My Later Years*, p. 59. New York: Philosophical Library, Inc., 1950.
3. *Ibid:* p. 60.
4. Goldfarb, William: The effects of early institutional care on adolescent personality. *J. Exper. Educ., 12:* 106, 1943.
5. Kardiner, Abram: *The Psychological Frontiers of Society.* New York: Columbia University Press, 1945.
6. Levy, David M.: Primary affect hunger. *Am. J. Psychiat., 94:* 643, 1937.
7. Rado, Sandor: Dynamics and classification of disordered behavior. *Am. J. Psychiat., 110:* 406, 1953.

134 Harmon Ave.
Pelham, New York

PERIPHERAL SENSORY INHIBITION OF PAIN WITH A PARIETAL LOBE LESION

With a Note on Audiogenic Fits[1]

SUMNER E. TRENT, M.D.

This is the report of an unusual neurological case which offers additional evidence for the existence of a mechanism for the inhibition of pain and temperature impulses by other sensory impulses coming from the periphery.

Previous Investigations

That peripheral afferent activity may be used by the organism in the suppression of cerebral activities such as pain and emotion has been recognized by other investigators.

Livingston states: "It has been suggested that the discriminatory sensations—touch, posture, etc.—normally exert an inhibitory influence on the impulses subserving pain, so that unless these impulses are so strong as to dominate the entire sensory pattern, the sensation of pain as such does not register in consciousness" (7).

Bieber has pointed out that people in emotional crises or severe pain will grip the edge of a table, clench their fists or teeth, bite their lips, or even injure themselves. Questioned later, these people are reported to explain their behavior as enabling them to control their tempers or bear the pain. Moreover, hemiplegics with central pain sometimes grasp the paralyzed hand with the usable hand in order to diminish the pain (4). (A similar purpose might be adduced to the rubbing and squeezing so often seen in everyday life after painful blows and lacerations.)

Bender describes a causalgia consequent to a peripheral nerve injury which was relieved by the patient's immersing the opposite hand in water (1).

Graham, Goodell, and Wolff report being able to abolish experimentally-induced itching on the skin of the back by pinprick in the same dermatome on the anterior chest (5).

[1] From the Neurological Service, Bellevue Psychiatric Hospital, New York.

The Case

History of present illness

The patient is a 32-year-old, former merchant seaman who, four years and five months before admission, had sustained one or more stab wounds in his left temporoparietal skull. On regaining consciousness in a local hospital, he showed signs of subarachnoid bleeding on spinal tap, a severe aphasia, predominantly motor, a right central facial palsy, a left homonymous hemianopia, and hyperactive deep tendon reflexes on the right side. Within a few days his facial palsy had disappeared and his aphasia somewhat improved and he left the hospital against advice. Four months later, he suffered the first of several right-sided tonic and clonic convulsions. They were preceded by apprehension and by tingling of the fingers of the right hand. Some attacks were noted to start in the right hand, move up the right arm, and later appear in the right lower extremity. He was admitted to Bellevue Hospital for the first time three weeks later after another convulsion. At that time he showed a left homonymous hemianopia, increased tendon jerks on the right, aphasia, and agraphia. There were no disturbances of body image, no Babinskis, and no sensory losses. It was discovered at that time that he had an old depression in the left temporal region, and a craniotomy done at that time revealed a small area of softening in the lower portion of the sensory cortex near Broca's area. About this, and scattered elsewhere, were yellowish foci of gliosis with a somewhat firmer than normal consistency. No foci requiring operative intervention were found, however. It was noted at that time that his left homonymous hemianopia could not be explained on the basis of this left parietal lesion, and it was considered to be a contracoup lesion secondary to the latter. He was discharged with a diagnosis of post-traumatic encephalomalacia of the left parietal lobe, with secondary diagnosis of motor aphasia

and right-sided motor Jacksonian epilepsy. He was later put on a regimen of sodium diphenylhydantoin (Dilantin) and phenobarbital. Most of his convulsions were either right-sided or started on that side and became generalized. One attack had an aura of colored lights, and others were followed by pain in his right arm or hand or the entire right side of his body. Sometimes the pain was felt only over his left temporal skull. Four months later (11 months after injury) he was again admitted because of the sudden onset of trismus and of spastic paralysis of the right upper extremity. This cleared up spontaneously within a few days, and he was again discharged.

The patient first came to the attention of the Psychiatric Division of Bellevue Hospital four years and five months after injury, when he was brought in because of another convulsion. He had been drinking heavily for some time. He stated that he began to notice pain in his right upper extremity nine months before this admission. It was intermittent at that time, coming on during either day or night, and sometimes waking him from sleep. At first six aspirin tablets were enough to stop it, but in time they became ineffective. Later he found that shoveling led to marked diminution of the pain, and he worked for some time at jobs entailing such activity. Eventually he discovered that any pressure on his right palm and fingers diminished the pain, and he adopted the practice of grasping his left arm with his right hand. His friend first noticed this five weeks before admission, and told us that he would maintain this position for long periods of time, even sleeping with his hands clasped. The patient later told us that the practical difficulty of maintaining this posture, with the resulting intervals of pain when it was not maintained, caused him to begin to use alcohol as an analgesic.

Admission examination

On admission he was found to have a left homonymous hemianopia and slight diminution of pinprick sensitivity on the right side of his face with simultaneous bilateral stimulation but not with single stimulation (1). His tendon jerks were enhanced in both right extremities, but abdominals and plantars were symmetrically normal. There was no evidence of meningeal irritation. Motor power, tonus, gait, and coordination were normal. There were no vasomotor, sudomotor, or trophic abnormalities. It was noted that he kept his right hand clasped on either his left arm or his left knee throughout the examination and resisted all attempts to free the hand. He was right-handed and right-eyed, and exhibited a severe aphasia. This was predominantly motor, but also included some sensory and some amnesic defect. His mental status was otherwise normal.

His sensory status held the most interest for this paper, however. Light touch perception and localization, two-point discrimination, and position sense were intact, but the other modalities showed striking abnormalities.

Spontaneous pain was felt over his entire right upper extremity and in his right axilla, and was maximal in his right thumb and right axilla. It was aching in quality and fluctuated in intensity from hour to hour and from day to day. It was completely eliminated, however, by pressure on the anterior surfaces of the tips of the four fingers of his right hand. (Later in the investigation, pressure on the tips of the fourth and fifth fingers alone sufficed to eliminate the pain.) During the examination the patient exerted this pressure by grasping his left arm or knee, or by clenching his right fist, and it was necessary for the examiner to maintain constant watch lest he do this surreptitiously during the tests which required the absence of this suppressor activity.

Hyperalgesia to pinprick existed over the flexor surface of the same right extremity. It extended upward onto the medial wall of the right axilla and the adjacent right chest in an area bounded superiorly by the clavicle, anteriorly by a vertical line 2 cm. lateral to the right nipple, inferiorly by the sixth intercostal space, and posteriorly by a line about 1 cm. medial to the posterior axillary line. The hyperalgesia was much more severe in the axilla than on the extremity itself, and was described as almost unbearable. All hyperalgesia completely and immediately disappeared when pressure was put on the fingertips of the right hand, as described above for spontaneous pain. A quantitative effect was noted during the first few days after admission: pressure on four fingers eliminated all pain, and on three fingers

most of it, while pressure on one only made the pain comfortably endurable. After these first few days, however, only the fourth and fifth fingers were needed for the complete suppression of spontaneous pain and for the reduction of the reaction to pinprick to within normal limits. There was a slight decrease in sensitivity to pinprick in the left upper extremity with pressure on the "inhibitor zone" of the right hand, but no such effect was noted on pinprick sensitivity in the lower extremities.

Sensitivity to temperature was likewise affected. It was measured by applying test tubes containing warm and cold tap water to various areas of the patient's skin. He was found to have an area of hyperesthesia for warmth and cold on the flexor surface of the right upper extremity. This hyperesthesia was maximal on the lateral and medial walls of the right axilla. As did the hyperalgesia to pinprick, this hyperesthesia for temperature similarly disappeared when pressure was applied to the fourth and fifth fingers of the right hand. Careful questioning at this time revealed the additional historical fact that the patient had noticed prior to his admission that hot dinner plates carried in his right hand felt much hotter than the same plates carried in his left hand.

Vibratory sense was found to be markedly impaired in the pretibial region of the right lower extremity and moderately impaired over the right iliac crest. It was also impaired in the right upper extremity over the olecranon process and the head of the radius, but was painfully intense when the tuning fork was applied to the medial wall of the right axilla. This hypersensitivity too was completely eliminated by light pressure on the four finger tips of the right hand. (Here too only the fourth and fifth finger tips were necessary later in the investigation.)

Special sensory studies

In the attempt to clarify the pattern of the sensory findings described above, a number of special sensory studies were done.

(a) *Pain adaptation time.* Pain adaptation time, the time it took for pain to die out with a constant maintained painful stimulus, was tested under suppressor conditions and was found to be clearly greater in the right upper extremity, axilla, and shoulder than in the corresponding areas in the left upper extremity, axilla, and shoulder. This could only be measured under suppressor conditions (i.e., with the fourth and fifth fingers of the right hand clasped) because of the severe pain otherwise involved. The stimulus was produced by a simple algesimeter consisting of a needle surmounted by a 5-gm. weight. The needle was held by the examiner perpendicularly over the skin areas to be tested. It was allowed to rest on the skin, with as little vertical force as possible exerted by the examiner's fingers. The adaptation time was the number of seconds after the application of the continuing stimulus before pain ceased to be felt. The data in table 1 are the averages of eight or more readings in

TABLE 1.—PAIN ADAPTATION TIME*

			Duration of Pain with Continued Stimulus†
			sec.
Axilla and shoulder	Right	Dorsal	16.1
		Ventral	11.6
	Left	Dorsal	5.8
		Ventral	5.2
Hand	Right	Dorsal	14.6
		Palmar	15.6
	Left	Dorsal	7.9
		Palmar	10.1

* Fourth and fifth fingers of right hand clasped.
† Stimulus: 5-gm. needle applied continuously.

TABLE 2.—TEMPERATURE ADAPTATION TIME*

		Duration of Perception of Heat or Cold†	
		Right axila	Left axilla
		sec.	*sec.*
Heat	Tube A	52	40
	Tube B	76	29
	Tube C	68	27
Cold	Tube D	74	27
	Tube E	50	32
	Tube F	55	38

* Fourth and fifth fingers of right hand not compressed.
† Stimuli: Test tubes of hot or cold water placed against skin of axilla.

the axilla and shoulder, and of 10 or more readings in each hand.

(b) ***Temperature adaptation time.*** Sensitivity to heat and cold was quantified as temperature adaptation time, and appeared on a small series (table 2) to be much greater in the right axilla than in the left. The stimulus was a test tube of hot or cold water placed in the axilla, and the adaptation time was the duration of the temperature sensation in seconds. The inhibitor fingers of the right hand were unclasped throughout.

(c) ***Suppression of hypersensitivity to temperature.*** Suppression of hypersensitivity to temperature by the suppressor fingers was measured by a "before and after" technique. This was done by placing a test tube of hot water in the patient's axilla while his suppressor fingers were compressed, measuring the time for the sensation of warmth to adapt out, and then releasing the inhibitor fingers. Invariably the sensation of warmth would reappear, and the time before this renewed sensation of warmth in the axilla would itself die out was then measured. This re-establishment of an adapted out sensation on release of the inhibitor fingers of the right hand was found to occur whether the test tube was placed in the right or the left axilla. However, the duration of the re-established sensation was twice as long when it was placed in the right axilla as when it was placed in the left (see table 3).

(d) ***Suppression by vibration.*** Vibration was a more effective inhibiting stimulus than superficial pressure when applied to the same inhibitor area. A vibrating tuning fork with a frequency of 256 vibrations per second placed against one of the inhibiting finger tips diminished the spontaneous pain considerably, and when one additional inhibiting finger was simultaneously compressed, all pain disappeared.

(e) ***Induced perceptions.*** Whereas the previous sensory findings involved perceptions at the point of application of the stimulus which were suppressed by pressure or vibration stimuli applied in another area, the following observations concern perceptions felt in an area very distant from both the area of the applied stimulus and the suppressor area. Here again stimulation of the suppressor area in the right fourth and fifth fingers suppressed the perception. The stimuli for the suppressed perceptions might be divided into two groups.

The first group of stimuli which induced distant perceptions later suppressed included pinprick, pinhead pressure, and warm and cold test tubes. The area stimulated was the left upper extremity and axilla. The area of induced perception was always one or more fingers of the right hand, regardless of the part of the left upper extremity or axilla which had been stimulated. The quality of the induced perception varied with the quality of the stimulus. Pinprick resulted in an induced pain or an induced sensation of rotation of the fingers, while heat and cold stimulation resulted in tingling of the fingers. The closer the site of stimulation was to the midline of the body, the greater was the intensity and extent of the induced sensation. The milder induced sensations tended to be restricted to the first three fingers of the right hand, while the more intense ones tended to spread to the fourth and fifth fingers as well.

Suppressor activity, as has been mentioned, was found to exist with induced perceptions

TABLE 3.—SUPPRESSION OF HYPERSENSITIVITY TO HEAT*

		Tube I	Tube II
Right Axilla	Duration of heat perception with suppressor fingers compressed	20 seconds	15 seconds
	Additional duration of heat perception with same tube after compression discontinued	54 seconds more	48 seconds more
Left Axilla	Duration of heat perception with suppressor fingers compressed	10 seconds	15 seconds
	Additional duration of heat perception with same tube after compression discontinued	22 seconds more	25 seconds more

* Stimuli: Test tubes of hot water placed against skin of axilla.

as it previously had been found with ipsilocally stimulated perceptions. Pressure on the fourth and fifth fingers of the right hand invariably reduced the intensity of the induced or heterolocal perception, and sometimes abolished it altogether.

It should be noted that this referral or induction of sensation differs from the allesthesia extensively investigated by Schilder (9) and Bender (3) in that in induction the patient still knows where he had been stimulated although he feels the induced quality elsewhere. In allesthesia the original locus of stimulation is not perceived as such at all. In both induction and allesthesia the quality of the heterolocal perception may or may not correspond to the quality of the ipsilocal stimulus.

The second group of stimuli which induced distant perceptions later suppressed included those produced by an inflated blood pressure cuff applied to any one of the four extremities. (Occlusion of arterial circulation by a blood pressure cuff as a stimulus to pain was investigated by Lewis (6) who found evidence that a tissue metabolite was responsible for the pain.) As soon as the pressure on the cuff reached a figure which apparently coincided with the diastolic blood pressure, pain appeared in the right thumb. This pain increased both in extent and in intensity with increase in pressure, and to a lesser extent, with increase in duration of constant pressure. The intensity and extent of pain induced in the right hand, as well as the pressure at which it appeared, were the same whether the cuff was applied to the right or left arm, or to either calf. As the intensity and duration of the pressure increased, the intensity of the pain increased, and it spread from the right thumb in succession over the hand, up the arm, into the axilla, down the right side of the trunk, and into the right thigh. There was no recession of pain with partial remission of pressure unless the pressure was brought below that at which the pain had first appeared. When this point was reached, however, the pain disappeared completely and all at once. At no time was it possible to maintain the pressure after the pain had spread down the right leg as far as the knee, because at that point the patient invariably protested violently about the pain and said that he was experiencing the sensation of pressure over his left parietal skull which usually preceded the onset of a convulsion. All the blood pressure cuff experiments were done under suppressor conditions, i.e., with the fingers of the right hand compressed. This was necessary because the pain otherwise aroused was too great to allow continued experimentation.

(f) *Summation of suppression.* Experiments with simultaneous bilateral stimulation revealed that although most of the suppression of pain was caused by stimulation of the fingers of the right hand, pressure or vibration applied to the fingers of the left hand increased the amount of pain suppression. Thus the patient felt more comfortable (when the pain was spontaneously intense) when he squeezed the fingers of his right hand with his left than when the examiner squeezed the same portions of the patient's right hand himself with maximum vigor. Moreover, the examiner's squeezing the patient's left hand while the patient exerted pressure on his own right hand resulted in the same maximum suppression as was produced by the patient's clasping his own two hands together, and the examiner's releasing the patient's left hand resulted in a moderate increase in pain in the right hand.

(g) *Extension of suppressor area by trauma.* During the course of his hospitalization the patient accidentally received a violent blow on the extensor surface of the middle third of his right arm. This was followed by a momentary intense pain felt in all four extremities and all over his trunk. For three days after that the spontaneous pain was more intense, although confined to the usual areas. In addition the palmar aspect of his right thumb and the flexor aspect of his right hand and forearm took over the function of suppressor areas along with the established areas on the flexor surfaces of the fourth and fifth fingers of that hand. After these three days the unusual pain and the additional suppressor areas rapidly died out, and the patient returned to his usual condition.

Other studies and procedures

(a) *Skull X-rays.* Routine plates revealed burr holes in the left parietal region and evidence of an old left parietal bone flap. There was no evidence of osteomyelitis.

(b) *Electroencephalogram.* A basic general-

ized pattern of waves of six to eight cycles per second was found. Superposed on this were occasional runs of very high voltage waves of one and one half to three cycles per second. These slow runs apparently originated in the left temporomotor region, where phase reversal centered, and spread anteriorly and posteriorly on the left side, and often to the right side as well. Stimulation of the right arm by pinprick, heat, and cold was followed by greater prominence of this slow activity. The effect of pressure or release of pressure on the suppressor fingers could not be determined because of poor cooperation and because of the intermittency of the slow bursts prior to stimulation.

(c) *Hypnosis.* The patient was hypnotized on three separate occasions.

On the first induction of hypnosis the suggestion was given that he would feel no pain anywhere in his body. As a result he denied feeling pain and did not wince when pricked over his left arm or in his left axilla while in this state. When pricked in the right axilla he winced, and although he had released the pressure on the suppressor fingers of his right hand while going under hypnosis, he now closed these fingers on the palm or pressed them on his thigh. When told that such behavior was a manifestation of pain when he felt no pain, he unclasped the right hand and squirmed about until he began to rub the fingers of his right hand on his head, an activity which he could not explain. When questioned closely he denied that the pinpricks in his right axilla were painful, but finally admitted rather testily in his aphasic fashion that they were "sharp as hell".

The second time he was hypnotized he was told that post-hypnotically the pain would disappear from the right arm and reappear in the left arm, and that this new pain in the left arm would be inhibited by pressure on the fingers of the *left* hand. During hypnosis his hands were separated, but he continued to flex and extend the fingers of his right hand and look at his right palm uneasily. While doing this he had a petit mal-like attack lasting about five or ten seconds. During it he fell forward in his chair and was unable to respond, and after it he appeared rather haggard. When he was brought out of hypnosis, his hands were grasped in the reverse pattern suggested under hypnosis (left hand grasping right arm), and he vigorously resisted their separation. He explained that his left hand and arm were painful and that only this behavior diminished the pain. Despite this explanation he continued to look rather worriedly at his right hand and forearm (which were hanging by his side), and several times he surreptitiously grasped the hem of his hospital gown with his right hand, only to release it quickly. In addition he seemed to be struggling against a tendency to flex the fingers of his right hand. He continued to look pale and haggard as though he were in great pain. Five minutes later, however, he was seen again, and his right hand was now grasping his left sleeve as it usually had done prior to hypnosis. He smiled easily and no longer appeared haggard. He explained that the pain had suddenly reappeared in his right arm and forearm a short while ago. He denied having any pain in his left arm now, and could not explain the preceding episode.

On the third induction of hypnosis an investigation was made of induced or heterolocal perceptions. It was suggested that he would feel no sensation on stimulation of his (unsuppressed) right upper extremity. He responded not only with an anesthesia of his right arm to pinprick, temperature, and vibration stimuli applied to that arm, but also with an anesthesia of the left arm when such stimuli were applied to the left arm. However, stimulation of scars and other sensitive areas of the left arm did give rise to grasping and pressing activity in the *right* hand despite denial of sensation. (This escape of the induced sensations from the suggested anesthesia may be due to the patient's not realizing its connection with the contralateral stimuli.)

(d) *Effect of drugs.* (i) *Morphine.* Morphine sulfate was given intramuscularly in a dose of 16 milligrams, and resulted in a very transient and only partial relief of spontaneous pain as determined by the patient's report. However, it afforded no relief from the necessity for inhibitory pressure stimulation. The subjective relief lasted about an hour.

This effect of morphine and the patient's turning to alcohol as an analgesic are consistent with the finding that both the opiates and alcohol, while raising the pain threshold

to a certain extent, have the additional effect of dissociating pain perception from pain reaction, so that the individual perceives considerable pain but does not react to it (11, 12).

(ii) *Meperidine.* Meperidine hydrochloride (Demerol®), given in a 100 milligram intramuscular dose, had essentially the same effect as morphine. It was also found to be powerless to influence a march of pain produced by arterial occlusion of an extremity by a blood pressure cuff. (This experiment was not tried with morphine.)

(iii) *Amobarbital.* Intravenous sodium amobarbital (Sodium Amytal®) in subanesthetic dosage (0.5 gm.) led to no decrease in extent or intensity of spontaneous pain or hyperalgesia to pinprick despite the strong verbal suggestion given to the patient that it would do so. On the contrary, it resulted in a transient extension medially of the area of hyperalgesia from its usual boundary at the posterior axillary line almost to the midline of the posterior thorax.

This extension of sensory pathology under the influence of amobarbital is consistent with the findings of other investigators (2, 3).

(e) *Peripheral nerve blocks.* Several attempts were made to eliminate the pain and hyperalgesia by peripheral blocks of the ulnar, median, and superficial radial nerves individually and in combination in the right wrist. The anesthetic employed was 2 per cent procaine hydrochloride in saline, which was injected subcutaneously about the appropriate nerve in the right wrist. Median block was essentially ineffective, and radial block led to only a slight decrease of spontaneous pain over the dorsum of the hand. Ulnar block, however, led to a marked decrease of spontaneous pain in the area centered about the right thumb. This effect lasted for several hours, and could be re-elicited by succeeding ulnar blocks. Hypersensitivity to pinprick or to arterial occlusion was unaffected by the block, however.

(f) *Stellate blocks.* Several procaine blocks of the right stellate ganglion all had the effect of decreasing the effect of the spontaneous pain for several days although they never caused the pain to disappear completely. This decrease in spontaneous pain was objectively manifested in his ability to leave his right hand "ungrasped" for up to a minute; the preblock limit was five to ten seconds.

(g) *Stellate sympathectomy.* On the basis of the favorable results achieved with the stellate blocks, a right stellate sympathectomy was performed. The rami to the sympathetic chain from the second and third thoracic nerves were severed, their intercostal nerves were transected and removed with their sensory ganglia, the stellate ganglion was removed, and the end of the sympathetic chain was buried in muscle (10). There was an immediate moderate decrease in the amount of spontaneous pain. On the sixth post-operative day the patient was able to keep his hands unclasped indefinitely on command, although he would clasp them again as soon as he was left alone. Arterial occlusion exerted by a blood pressure cuff applied to any extremity still caused pain in the right thumb, and this pain was again markedly decreased by pressure on the right fourth and fifth fingers.

(h) *Rebound hypersensitivity and audiogenic attacks.* By the end of the second post-operative week, however, the spontaneous pain had not only increased beyond its former intensity, but had spread posteromedially into the right subscapular region and anteromedially as far as the right nipple. Moreover, the patient was now complaining that the whistling of ward personnel caused an increase in spontaneous pain in his right arm and right axilla and made it impossible for him to speak for periods of several minutes. There had been previous complaints that high pitched sounds had caused dizziness, left parietal scalp paraesthesias, and right arm pain, with the feeling that a convulsion was impending. It was found that this pattern could be induced by sounding high pitched notes on the ward piano. The second f above middle c and all the notes above this f always produced this reaction, while the e just below it sometimes did, and the notes below that e never did. The patient claimed that he had several convulsions as the result of auditory stimuli such as steamboat whistles, but whether he was referring to convulsions or to aphasic and sensory fits was not clear because of his difficulty in communication.

(i) *Tentative explanation.* We can explain the findings in our case in terms of a closed chain of neurons functioning to fractionate the central nervous system into relatively active and inactive channels. (This is the explanation

of central inhibition offered by Lorente de No. He pointed out that a *short* closed or circular chain of neurons could inhibit the tangential synapse of a contiguous open chain. This could occur because the impulses in the short closed chain would return to their origin in the closed chain before the expirations of the refractory periods of the first synapse of the closed chain and of the tangential synapse of the open chain. A long closed chain, on the other hand, would facilitate rather than inhibit the tangential common synapse since the circulation time of the closed chain would be greater than the refractory periods of these synapses (8).) If we postulate a region in the left parietal cortex made hypersensitive by local scar tissue, we can explain the alterations in the feed-in of the excitatory impulses to this region in terms of the function of such a closed chain. Two chains are necessary—one open and one closed. The first chain, the open one, is the input for the hypersensitive cortical region, which is fed by many peripheral sensory channels—e.g., unperceived right ulnar nerve impulses, pain and temperature impulses, and auditory impulses resulting from high pitched sounds. The second chain of neurons is a closed one which inactivates the input when the input tension is not too high. This second chain would be fed by touch, pressure, and vibration impulses, especially those from the ulnar region of the right hand. While specific bodily regions have predominant inhibitory or excitatory functions with given stimulus modalities in this case, stimuli from any part of the body may channel into the inhibitory or excitatory circuits.

It should be noted that the inhibitory function of the closed chain is not adequate when the input tension in the open chain is too high—e.g., when pinprick stimuli are applied to the right axilla or when the arterial circulation in an extremity is occluded by the blood pressure cuff. This could be explained as due either to the opening of new chains with higher thresholds which are not susceptible to the inhibiting chain, or to the opening up of a closed chain with a higher threshold which inhibits the usual inhibiting chain. When uninhibited high input does operate as a result, the flooding of the irritable sensory cortex causes a sensory march, and, if inhibition does not then occur, a motor convulsion.

As to the origin of this particular case's choice of inhibitory and excitatory pathways—e.g., impulses from the right fourth and fifth fingers and the right axilla—one might speculate that the central nervous system had available a multitude of internuncial pools of varying temporal characteristics, and that these several were activated because they happened to fit the temporal characteristics of one another and of the sensitive region in the parietal cortex (8).

Summary

Clinical findings

1. An old brain injury is accompanied by circumscribed pain and temperature sensations in the extremities in the apparent absence of external stimulation.

2. These sensations can be inhibited by peripheral stimulation of another bodily area in the modalities of superficial pressure, vibration, or touch.

3. Procaine block of the nerve of this second bodily area results in the same inhibition of pain and temperature sensations in the first area as is achieved by stimulation of this second area by these inhibiting pressure, vibration, or touch stimuli.

4. These apparently spontaneous pain and temperature sensations are enhanced in intensity by pain or temperature stimuli applied to the area of painful or hot sensation.

5. If the pain stimulus thus applied is intense enough, the initial spontaneous pain increases in area and spreads over the body according to the pattern of a cerebral march, and is accompanied by increased difficulty in speaking, dizziness, and the feeling of an impending convulsion.

6. During a period of more intense spontaneous pain, high pitched sounds lead to increased local pain, dizziness, the inability to speak for several minutes, and the feeling of an impending convulsion. There were unverified reports of nocturnal convulsions precipitated by shrill noises.

Conclusions

From these findings we may draw the following conclusions:

1. Peripheral discriminative stimuli are able to inhibit the pain due to a brain lesion.

2. This central pain may be enhanced by peripheral pain stimuli.

3. Unperceived continuous afferent impulses (maximal in this case in the right ulnar nerve) help to maintain and enhance the central pain. (This third conclusion seems necessary in view of the suppressor effect of procaine block of the right ulnar nerve. These unperceived afferent impulses may be for muscle tension, joint position, or vasomotor status, or they may be unperceived discharges from skin receptors.)

4. These findings are consistent with those of other investigators.

Addendum

After completion of this paper it occurred to the writer that further research may establish a connection between these findings and both the activating system of Magoun and the diffuse afferent inhibitory system of Morison and Dempsey (13).

BIBLIOGRAPHY

1. Bender, M. B.: Extinction and precipitation of cutaneous sensations. *Arch. Neurol. & Psychiat., 54:* 5, 1945.
2. Bender, M. B., and Nathanson, M.: Patterns in allesthesia. *Arch. Neurol. & Psychiat., 64:* 501–515, 1950.
3. Bender, M. B., Shapiro, M. F., and Teuber, H. L.: Allesthesia and disturbance of the body scheme. *Arch. Neurol. & Psychiat., 62:* 221–231, 1949.
4. Bieber, Irving: Unpublished observation.
5. Graham, D. T., Goodell, H., and Wolff, H. G.: Neural Mechanisms Involved in Itch, "Itchy Skin", and Tickle Sensations. *J. Clin. Invest., 30:* 37–49, 1951.
6. Lewis, T.: *Pain.* New York: Macmillan, 1942.
7. Livingston, W. K.: *Pain Mechanisms.* New York: Macmillan, 1943, p. 60.
8. Lorente de No, R.: Analysis of the activity of the chains of internuncial neurons. *J. Neurophysiol., 1:* 207, 1938.
9. Schilder, P.: *The Image and Appearance of the Human Body.* (Psyche Monograph No. 4) London: Kegan, Paul, Trench, Trubner & Co., 1935.
10. Smithwick, R. H.: Resection of thoracic sympathetic supply to the arm. *Ann. Surg., 104:* 339, 1936.
11. Wolff, H. G., Hardy, J. D., and Goodell, H.: Studies on pain: Measurement of the effect of ethyl alcohol on the pain threshold and on the "alarm reaction". *J. Pharm. & Exper. Therap., 75:* 38–49, 1942.
12. Wolff, H. G., Hardy, J. D., and Goodell, H.: Studies on pain: Measurement of the effect of morphine, codeine, and other opiates on the pain threshold, and an analysis of their relation to the pain experience. *J. Clin. Invest., 19:* 659–680, 1940.
13. Gellhorn, E.: *Physiological Foundations of Neurology and Psychiatry.* Minneapolis: University of Minnesota Press, 1953, pp. 179–228.

4301 Atlantic Ave.
Long Beach 7, California

PHANTOM LIMB SYNDROME OCCURRING DURING SPINAL ANESTHESIA

Relationship to Etiology

JAMES ENGLISH MILES, M.D.[1]

Introduction

Since the classical characterization of the phantom limb syndrome by Weir Mitchell in 1872 as a "sensory ghost" (28), the subject has commanded much attention and has given rise to no little dispute. The controversy revolves around the question of etiology: Does the phantom arise as a discrete sensation on a purely organic neuropathic basis, or does it spring as a type of illusion from the mind as a result of the physical violation of amputation? The answer to this question is unclear, and the phenomenon remains nearly as mysterious today as it was in the Civil War period when Mitchell wrote.

The presence of the phantom following amputation is said to be almost invariable (1, 6, 15, 22, 24, 28, 34). It appears that one must have had the experience of living with a functional limb prior to loss for it to occur (1, 22). Thus, it does not occur in congenital absence of an extremity (1, 29) or loss in early life (8, 29). It occurs in children beyond the age of 5 or 6, but not before (3, 8, 29). Experience of the phantom is so nearly universal that its absence may be considered psychologically abnormal (8). The phantom frequently does not make its appearance for some time after the amputation (1), and usually not until the amputee becomes aware of his loss (22). The appearance of the phantom may be initiated by micturition (22) and by voluntary effort (20). Its appearance may be controlled by hypnosis in some cases (17, 37). Handling the stump or wearing a prosthesis may also affect the phantom (23).

Loss of the part is not necessary for the phantom experience. It has been described in paraplegics (4, 10, 11), and bizarre phantoms such as those of supernumerary limbs have occurred with extensive injury to the spinal roots and peripheral nerves (12, 40). Of interest in connection with the present study is the report of a case by Toker of phantom limb pain in connection with spinal anesthesia (41). Phantoms of the upper extremities are said to be more pronounced than those of the legs (20). The sensory impression of distal parts of the phantom is clearer than proximal parts, fingers and toes being most discernible. In some cases the phantom hand or foot is felt as though projected some distance from the body without any impression of the intervening part (35).

The phantom may normally be felt in bizarre or impossible positions, but is said to assume most frequently the position of a hemiplegic extremity (20). The phantom may disappear by telescoping, or it may seem to come and go and to be noted in different attitudes at different times. Impressions of movement in the phantom are not unusual, and small movements of phantom fingers and toes are most frequently described (22).

Pain is considered abnormal in the phantom experience and occurs in only a small percentage of amputees (1, 15, 20, 27). It is generally considered to be of primarily psychogenic origin (8, 16, 17) and usually indicative of severe psychopathology (15). It is felt that occurrence of phantom pain is related to contact with other amputees and to people with painful phantoms (23). Bizarre and uncontrollable posturing of the phantom is unusual and is often associated with phantom pain (22).

Etiology

Many observers have felt that the phantom limb syndrome may best be accounted for on an organic basis (5, 9, 21, 26, 27, 30, 35). The phantom has been attributed to peripheral neuromas at the site of amputation (30, 31, 36), with the suggestion that the constant stimuli arising from these irritable foci give rise in some manner to the phantom experience (24, 33, 42). Some would account for even "psychopathologic reactions" to the phantom on this basis (26).

[1] The observations and opinions expressed in this paper are solely those of the author and are not intended to reflect the opinions or policy of the Veterans Administration.

Stressing the importance of the proprioceptive system in postural orientation, several authors have implicated the posterior columns of the spinal cord (7, 8, 25, 32). They point to well-documented cases of phantom phenomena with cord lesions, including total transections (4, 10, 11) and root injury (12).

The importance of the thalamus as a primitive seat of sensation has been emphasized (14, 18), and it has been postulated as a possible site of origin of the phantom. The occurrence of phantoms in thalamic disease has been pointed out (38).

There are also those who, while not accepting a purely psychogenic explanation for the phantom, would explain it as a manifestation of the sensory cortex, implicating primarily the postcentral gyrus of the parietal lobe (2, 13, 33, 39).

There are also many articulate workers who feel that the phantom experience is of psychogenic origin (1, 19, 23, 34). It is thought in general psychologic terms to represent an illusion occurring normally, which is not perfect and which only approximates reality (6). The phantom is thought to arise in some manner as a response to the interruption of body continuity which occurs with amputation (37). Phantom limb pain is felt by some observers to have no physical basis, and is explained as "algo-hallucination" or hallucination of pain (25). The views of this group, which invoke the concept of body image (37) and suggest that the phantom is a transitory defense by the mind against the trauma of amputation, will not be considered in detail here.

Observations

Forty-two male patients were observed during spinal anesthesia. These were predominantly young individuals undergoing elective surgery with minimal pre-operative sedation.

The anesthetic mixture consisted of: 0.2 cc. epinephrine solution 1:1000, 0.8 cc. (8 mg.) of a 1 per cent Pontocaine (tetracaine) solution, and 1.0 cc. of a 10 per cent glucose solution. Spinal puncture was performed in a routine fashion. With the patient in the lateral decubitus position the third or fourth lumbar interspace was entered with a no. 22 needle, and the anesthetic mixture was introduced. Analgesia was usually obtained as high as the sixth or fifth thoracic dermatomes.

After induction of anesthesia 34 patients noted the presence of a phantom which remained throughout the period of analgesia. Four others noted transient phantom sensations which were not sustained. Leading questions were avoided, and each patient described a clear phantom sensation in his own words, not merely in terms such as numbness or tingling. Of the 42 patients, 4 did not note the presence of a phantom or could not be certain about its presence.

The phantom was bilateral in all cases although some subjects could not distinguish a right and left phantom limb but noted only one central extremity. Phantom feet and toes were regularly perceived more clearly than other parts. The phantom was noted to change position spontaneously and to assume bizarre positions in some cases. No subject had any sense of voluntary control over phantom movement. No patient experienced pain, and none evidenced fear or any sense of loss. Many were quite curious about the experience. No patient noted a phantom rectum or penis, or any sensation of erection, and there was no altered sensation in the upper extremities. The phantom seemed generally to disappear suddenly, without telescoping or diminution in size, some time before the return of any sensation with anesthetic recovery.

Four patients undergoing unilateral amputation under spinal anesthesia were also observed. All were older men operated for occlusive vascular disease and were alert with moderate sedation during the procedure. Screening prevented the patients from observing any of the procedure. After anesthetic induction all 4 patients described the presence of a bilateral phantom. In all cases the phantom remained, apparently unaltered, post-amputation. In three cases the bilateral phantom disappeared completely before anesthetic recovery. One patient noted that the phantom continued after recovery on the side of amputation only. He described it as being "fainter" than the bilateral phantom experienced during anesthesia. No patient experienced pain. Affect was generally that of mild depression, with no sense of loss or impending dissolution during the amputation. No patient manifested curiosity or concern about the disposal of the amputated part.

Discussion of Observations and Etiology

It appears from the above observations that a phantom limb syndrome is induced experi-

mentally in the majority of male subjects during spinal anesthesia. The figures presented above compare favorably with the reported incidence of 95–100 per cent for amputative phantoms (1, 4, 15) and 100 per cent for phantoms in paraplegics (4).

This artifically-induced phantom does not appear to differ from that occurring after amputation or neurologic damage in any important respect except that it is transient and reversible. The experimental phantom resembles that of paraplegia in that no telescoping effect was noted (4). The fact that the phantom occurs transiently and immediately after anesthetic induction suggests that no specific element of psychic or physical trauma either by way of loss of limb, destruction of tissue, or retrograde neuronal degeneration is necessary for its production, although some aspects of the phantom such as pain may be related to such trauma. The absence of any phantom representation of the penis is in contrast with the observations of Bors (4) on paraplegics in whom the phantom penis occurred in 19 of 50 patients with erection phantoms in 14. He also observed a high incidence of volitional phantom movement. It is possible that his observations in these areas may reflect the impact of paraplegia on the personalities of the patients studied.

When amputation of the leg occurs in paraplegics, the phantom limb is unchanged and resembles that of other paraplegics (4). The situation is apparently similar in the case of the anesthetic phantom which is not altered by amputation.

To consider again the troubled question of etiology, it is felt that available evidence supports the view that the phantom arises primarily from higher cortical centers. Evidence presented above has shown that typical phantoms may occur whenever an extensive area involving one or more extremities is deprived totally of sensory and motor function, whether the neurologic lesion occurs in the peripheral nerves, the spinal roots, the spinal cord, the thalamus, or the sensory cortex. It would thus appear that neither a peripheral neuroma nor a specific lesion of the cord is the decisive factor in the production of the phantom. In each case one must look to some higher center as the source.

The fact that the phantom limb often tends to assume the position of a hemiplegic extremity suggests some relationship to the upper motor neuron, as does the observation that parts which have the greatest cortical representation such as fingers and toes are often the most prominent and lasting features of the phantom.

The fact that the phantom does not appear in early childhood suggests that it is not present strictly on the basis of some neuronal lesion, and that some degree of learning is necessary to experience the phantom. The phantom is in most cases not a permanent phenomenon, and tends to diminish and disappear with time, suggesting that it can be modified by experience, unlike a specific neurologic deficit state. Observations that the phantom does not usually occur until the amputee becomes aware of his loss, and that voluntary effort as well as hypnosis can control its appearance in some cases, offer additional evidence that at least some aspects of the phenomenon are a function of higher cerebral centers. This conclusion is further supported by the demonstration of psychopathology in cases of phantom limb pain.

Conclusions

1. Of 42 male patients observed, 38 experienced the phantom limb phenomenon during spinal anesthesia. The phantom was bilateral in all cases and tended to appear and disappear suddenly and completely. It was present in 34 cases throughout the period of analgesia and closely resembled the phantom occurring after amputation or neurologic damage. No patient experienced pain or fear regarding the phantom, and the prevailing attitude was that of curiosity.

2. During unilateral amputation under spinal anesthesia, 4 male patients experienced bilateral phantom limbs. With anesthetic recovery the phantom disappeared completely and was not replaced by a unilateral phantom for several days in 3 out of 4 cases. The phantom persisted weakly, on the side of amputation only, in one patient after recovery from anesthesia.

3. The phantom limb syndrome is a normal experience which may appear transiently and reversibly. Loss of limb, destruction of tissue, or the threat of same is not necessary for its occurrence. Its presence during spinal anes-

thesia may be explained as a result of the direct effect of the anesthetic agent acting locally on the spinal cord, or as a reaction of the mind to the complete sensory and motor deprivation of the lower extremities. Evidence would appear to substantiate more strongly the latter explanation.

BIBLIOGRAPHY

1. Bailey, A. A., and Moersch, F. P.: The phantom limb. *Canad. M. A. J., 45:* 37–42, 1941.
2. Beller, A. J., and Peyser, E.: Prefrontal lobotomy for phantom limb and phantom pain. *J. Internat. Coll. Surg., 16:* 432–435, 1951.
3. Boeri, R., and Negri, S.: Algie da amputazione ed arto fantasma: un caso di particolare interesse. *Minerva Med. (Torino), 44:* 234–235, 1953.
4. Bors, E.: Phantom limbs of patients with spinal cord injury. *Arch. Neurol. & Psychiat., 66:* 610–631, 1951.
5. Bourguignon, G., and Weil, B.: Les chronaxies vestibulaires et les chronaxies sensitives dans les membres fantômes. *Rev. Neurol., 89:* 365, 1953.
6. Brain, R. W.: *Diseases of the Nervous System.* London: Oxford Univ. Press, 1947, pp. 108–109.
7. Browder, J., and Gallagher, J. P.: Surgical treatment of painful phantom limb. Preliminary report. *N. Y. State J. Med., 46:* 2403–2405, 1946.
8. Browder, J., and Gallagher, J. P.: Dorsal cordotomy for painful phantom limb. *Ann. Surg., 128:* 456–469, 1948.
9. Chavany, J. A., Pecker, J., and Hagenmuller, D.: Remarques sur les douleurs des amputés: considérations cliniques et thérapeutiques sur un cas d'algie diffusant en direction ascendante. *Sem. Hop. Paris, 30:* 1936–1940, 1954.
10. Choh-Luh Li, and Elvidge, A. R.: Observations on phantom limb in a paraplegic patient. *J. Neurosurg., 8:* 524–527, 1951.
11. Cook, A. W., and Druckenmiller, W. A.: Phantom limb in paraplegic patients; Report of two cases and analysis of its mechanism. *J. Neurosurg., 9:* 508–516, 1952.
12. Critchley, M.: Phantom supernumerary limb after cervical root lesion. *Arq. Neuro-Psiquiat., 10:* 269–275, 1952.
13. Dutaillis, P., and Weil, B.: A propos d'un membre fantôme douloureux de type cortical pur, sans douleurs du moignon, avec comportement psychique normal; discussion pathogenique et thérapeutique. *Rev. Neurol., 89:* 364, 1953.
14. Edinger, D.: Quoted in the Yearbook of Neurology and Psychiatry, 1944. Edited by Hans H. Reese, and Nolan D. C. Lewis, p. 160.
15. Ewalt, J. R., Randall, G. C., and Morris, H.: The phantom limb. *Psychosom. Med., 9:* 118–123, 1947.
16. Falconer, N. A., and Lindsay, J. S. B.: Painful phantom limb, Treatment by high cervical cordotomy. *Brit. J. Surg., 33:* 301–306, 1946.
17. Gallinek, A.: The phantom limb, its origin and its relationship to hallucinations of the psychotic state. *Am. J. Psychiat., 96:* 413–422, 1939.
18. De Gutierrez-Mahoney, C. G.: The treatment of painful phantom limb by removal of post-central. *J. Neurosurg., 1:* 156–162, 1944.
19. Head, H.: Sensory disturbances from cerebral lesions. *Brain, 34:* 187–189, 1911.
20. Henderson, W. R., and Smyth, G. E.: The phantom limb. *J. Neurol., Neurosurg., & Psychiat., 11:* 88–112, 1948.
21. Hermann, L. G., and Gibbs, E. W.: Phantom limb pain: its relation to the treatment of large nerves at the time of amputation. *Am. J. Surg., 67:* 168–180, 1945.
22. Hoffman, J.: Phantom limb syndrome. *J. Nerv. & Ment. Dis., 119:* 261–270, 1954.
23. Kolb, L. C., Frank, L. M., and Watson, E. J.: Treatment of the acute phantom limb. *Proc. Staff Meet. Mayo Clin., 27:* 110–118, 1952.
24. Leriche, C. R.: Les douleurs, des moignons d'amputation. *Presse med., 40:* 869–873, 1932.
25. Lhermitte, J., and Puech, P.: Algohallucinosis in amputations; treatment by resection of neuroma, infiltration of sympathetic chain, double posterior myelotomy, and resection of the right parietal lobe. *Rev. Neurol., 78:* 33–35, 1946.
26. Livingston, K. E.: The phantom limb syndrome. A discussion of the role of major peripheral nerve neuromas. *J. Neurosurg., 2:* 251–255, 1945.
27. Livingston, W. K.: Phantom limb pain. *Arch. Surg., 37:* 353–370, 1945.
28. Mitchell, Weir: *Injuries of Nerves and their Consequences.* Philadelphia: Lippincott & Co., 1872.
29. Pick, A.: Ein Beitrag aus der Kriegs Medizin. *Neurol. Zentralbl., 34:* 257–265, 1915.
30. Pitres, A.: Etude sur les sensations illusoires des amputés. *Am. médico-Psychol., 5:* 1–18, 117–192, 1897.
31. Pitres, A., Souques, and Poisot: Origine peripherique des members amputés. *Rev. Neurol., 13:* 1112–1116, 1905.
32. Pool, J. L.: Posterior cordotomy for relief of phantom limb pain. *Ann. Surg., 124:* 386–391, 1946.
33. Pool, J. L., and Bridges, J. T.: Subcortical parietal lobotomy for relief of phantom limb syndrome in the upper extremity: a case report. *Bull. N. Y. Acad. Med., 30:* 302–309, 1954.
34. Randall, G. C., Ewalt, J. R., and Blair, H.: Psychiatric reactions to amputation. *J. A. M. A., 128:* 645–652, 1945.
35. Riddoch, G.: Phantom limbs and body shape. *Brain, 64:*197–222, 1941.
36. Russell, W.: Painful amputation stumps and phantom limbs treated by repeated percussion to stump neuroma. *Brit. M. J., 1:* 1024–1026, 1947.
37. Schilder, P.: The image and appearance of the human body. Psychological Monograph no. 4, London: Kegan, Paul, Treuch, Trubner & Co., Ltd., Broadway House, 1935.
38. Seitelberger, F.: Phantom manifestations in thalamic diseases. *Wien. Zeitschr. Nervenkrankh., 4:* 259–265, 1952.
39. Shevchenko, Y. G.: Role of cerebral cortex in pathogenesis of phantom limb pain; therapeutic deductions (Russian). *Nevropat. i. Psikhiat., 20:* 41–49, 1954.
40. Stengel, E., and Steele, G. D. F.: Unawareness of physical disability (anosognosia). *J. Ment. Sc., 92:* 379–388, 1946.
41. Toker, P.: Phantom limb pain associated with spinal analgesia; case. *South African M. J., 25:* 587–588, 1951.
42. White, J.C: Pain after amputation and its treatment. *J.A.M.A., 124:* 1030–1035, 1944.

VETERANS ADMINISTRATION HOSPITAL
LONG BEACH 4, CALIFORNIA

CROSS-CULTURAL PSYCHOTHERAPY

MARY McFAYDEN BISHOP AND GEORGE WINOKUR

Introduction

The numerous national groups and social classes of which all countries are composed point clearly to the fact that differences in values and backgrounds between the therapist and the patient are likely to be important on the course of the interpersonal relationship which characterizes psychotherapy. Although there are many anthropological and sociological papers analyzing different cultural patterns, there is a paucity of literature on the problem of psychotherapy in which the patient and therapist are from different backgrounds. Redlich and others have noted that in this country most out-patient therapy is carried on between doctors and patients, both drawn from upper middle class backgrounds (11). The question arises immediately how much relative similarities in backgrounds may contribute to success in this situation. Ruesch points out that when a therapist deals with a patient of a different cultural background, the difficulties lie both in the problem of values and communication (12). The psychiatrist inevitably carries with him experiences, not only as a person, but as a member of his social group and of his profession. Because of national pride in a casteless society in the United States, there is a tendency to overlook the real, but often unrecognized, differences between values and attitudes characteristic of different social classes within our society. For example, in the area of sexual mores, Kinsey has pointed out the difference between the attitude of middle and lower classes toward extramarital sexual behavior (5). It is considered important that the therapist not only avoid imposing his personal value system upon the patient, but also that he be aware of subtle differences in group mores and attitudes when dealing with a patient from a different background. Ruesch believes that the therapist may be even less aware of differences in communication, especially of the non-verbal variety, which may lead to misinterpretation of "cues pertaining to familiarity and distance, to status superiority and inferiority, of similarities and differences in approval and disapproval, which are not shared in common." In the field of child psychiatry, a great deal of attention is given to the problem of communication and of values, which are vastly different for the young patient than they are for the therapist. This is true not only for the small child but for the adolescent. As an example of the latter, Neavles has described the development of considerable skill in the discreet use of jive talk to enhance his rapport with adolescents (10). It appears, therefore, that knowledge of the cultural background of his patient will aid the therapist in two ways: he can come to a truer evaluation of the patient's difficulties, and he can avoid guiding him into patterns of thought and behavior, which although acceptable to the latter's society might be grossly inappropriate when the patient returns to his own group.

In the light of the above considerations this paper is concerned with a specific problem in this realm; the problem of psychotherapy with a Japanese male physician by an American woman psychiatrist.

It was evident to the therapist that she could not work effectively with this patient without some knowledge of Japanese culture. In order to make this presentation more meaningful, a brief summary is presented, which is drawn from Benedict's study of Japan and to a lesser degree from other reports (1, 4, 6, 8, 9).

Japanese Culture

Benedict states that the Japanese nation is conceived as a harmoniously organized entity in which every individual has his proper place and that, "Any attempt to understand the Japanese must begin with their version of what it means to 'take one's proper station'".

Great confidence is placed in order and hierarchy, and behavior is governed by meticulous rules and conventions. In this knowledge of one's proper place, and its consequent prescribed behavior, the Japanese finds his

security. The corollary of this concept of collective security is a deep mistrust of individualism. In this connection Maloney concludes from his study of psychoanalysis as practiced in Japan, that the Western analysts' goal of freeing the individual is directly opposed to the Japanese ideals of conformism. He showed that in importing the concepts of analysis the Japanese have altered and adapted them to conform to acceptable national principles (7).

Obligations, respect, and privileges are defined by birth, sex, and social position. The Japanese is profoundly aware of his indebtedness to his predecessors and superiors. The Japanese word 'on' in this connection signifies obligation, but also connotes much more. It implies also unquestioning loyalty, devotion, and reverence. As a small return for all the benefits received, Benedict quotes a common saying that "One never repays on ten thousandth of an 'on'". However, the Japanese spends his life trying to pay off his debt, regardless of "his mere personal preferences". Within the family this is reflected in attitudes and respectful behavior. As head of the family the father, or gradfather if he is living, bears the responsibility for the conduct of the family affairs. This is not felt to be a personal dictatorship but a trusteeship of family power and resources. In return he is accorded highest respect. The eldest son as heir early feels his responsibilities and privileges. Next in line are the younger brothers in order of birth, and lastly, the women. The details of the respect-behavior are among an infant's earliest lessons, for the small baby carried on his mother's back has his head pushed into a bow when he meets a member of the family to whom reverence is due. It is expected that these actions are expressions of real respect and devotion, and apparently open aggression is well suppressed toward authority figures. Inevitably, of course, hostility will occur, but if one cannot express it to those above, he can always gain satisfaction by exacting deference from those below. The males are in a favored position in that they can work off hostility on the women. Even a very small son can vent his anger with relative impunity upon his mother and sisters. For the girls the problem is more difficult. However, when they grow up, they can exercise considerable control in the running of the household and servants. A woman's great chance apparently comes when she is a mother-in-law and has great power over her son's wife. A high degree of antagonism is common and even expected in this relationship. This submissive principle is similarly applied to relationships with one's superiors on up to one's supreme devotion to the nation and ultimately to the Emperor. Maloney believes that the Japanese analysts "identify the superego with the unlimited power and person of the Emperor". In contrast to the acceptance of the 'on' received from the Emperor and parents of which one cannot repay one ten thousandth, and which permits no acceptance of hostile feeling, is the attitude toward recognition of 'on' from people outside of the family. This is felt as truly onerous. Benedict states that in contrast to the filial piety which the Japanese culture shares with other orientals the concept and feeling of obligation of outsiders are peculiarly Japanese. It is expected that any debt for service, kindness, etc., will be paid off with almost mathematical precision. This obligatory repayment is "giri", and there is a Japanese saying that "giri is the hardest to bear". Benedict says that the Japanese language is full of phrases expressing "resentment and emphasis upon the pressure of public opinion which compels a person to do giri against his wishes". So lively is this sense of obligation with necessity for repayment that the traditional Japanese may actually feel it is not a kindness to proffer assistance to another, knowing that he will thereby "tangle him with giri". In addition to giri to the world, there is also giri to one's name which involves a jealous regard for one's self-respect and prestige, even to the duty to clear one's name by revenge if necessary. Giri to one's name also includes the obligation for observing proprieties, including "curbing all displays of emotion on inappropriate occasions". If hostility is repressed toward one's parental figures, there is obviously ample opportunity for its acceptance and expression in doing giri. Great emphasis is laid on attitudes toward obligation because it is felt to be the basis for and the explanation for what seems to the American a paradox in the Japanese character, namely his capacity, on the one hand, for submission, and on the other, for violence.

In training the children the Japanese lean

heavily upon social disapproval as a control of behavior. This is in contrast to the American attempts to inculcate a sense of guilt as a control. Shaming and teasing are important means in discipline. If necessary this is carried to the point of threatening not only the child's status, but even his connection with the family, thereby exploiting the child's fear of rejection and separation-anxiety to produce conformism. Physical punishment is not frequent, but is used as an extreme measure. Toilet training is begun during the first year, but rather than being accomplished by harsh punishment, it is imposed as "an inescapable routine implacably insisted upon". From early childhood there is considerable emphasis upon neatness and cleanliness. On the other hand, so long as the child fulfills his obligations, he is treated very permissively, and there are much warmth and affection and indulgence toward small children. There is considerable freedom to gratify impulses in the areas of eating, autoeroticism, aggression, and so on during the early period. The mother is the chief disciplinarian, and the father, for all his august position, takes a warm, active interest in his children. When the child is about eight, his golden period of freedom is gradually restricted as he is made more aware of his coming adult responsibilities. The fear of embarrassment, ridicule, and shame is emphasized and stays with him all his life.

The Case Report

The patient was a successful, 56-year-old married Japanese physician from a large city on a Pacific island. For the past three or four years he had been increasingly dissatisfied with his professional work since it failed to meet standards of perfection he had set for himself. He also developed numerous compulsions and obsessions. For instance, smoking had become a compulsive need; and while driving his car, he was frequently obsessed with the fear that the steering wheel might come off in his hands. During this period he also felt increasingly weak, and retired early although he did not sleep well. Dr. N's father was a Buddhist priest who was 20 years older than the patient's mother and who died when the patient was six years old. The patient lived with relatives in Japan until he was 11 at which time he and his mother joined the household of his eldest brother on the island. Following the patient's graduation from college near home, he was determined to study medicine. With such money as he was able to earn himself he enrolled in an American medical school, and when his funds ran out, he appealed to his rather aggressive, domineering sister-in-law to finance the rest of the education in spite of her earlier expressed opposition to his becoming a doctor. It seems important that in discussing this he constantly referred to the sister-in-law rather than to his brother. Following internship he returned home and soon built up a thriving general practice. At the age of 30, Dr. N. married a nurse. This girl was a Christian Nisei and a graduate of American schools. Although in growing up she had had much more contact with cosmopolitan society than did the patient, she was described by the patient, and independently by his nephew, as a person without many social contacts, but who was in her own home out-spoken and controlling. There were three children, two girls ages 10 and 12, and a boy age 9. The patient seemed to have little insight into what his family did or thought. He usually quoted his wife when asked about the children's activities and training. It was a constant complaint of the wife that he did not spend enough time with them. The early years of the marriage were described as "happy". Disagreements between the two were usually characterized by verbal aggression on the part of the wife and a token resistance by the husband, followed frequently by passive withdrawal. In former years he could often gain satisfaction by carrying out his own intents in spite of her opposition, but with his illness he was increasingly unable to deal with his wife. He suffered from guilt feelings if he did oppose her, and seethed with resentment if he did not. Throughout their married life there was discord between the patient's wife and his own relatives. The situation became acute when the aged mother who was living with the eldest brother became chronically ill about three years prior to the patient's admission to the hospital. The eldest brother and his wife wanted the patient and his wife to assume more responsibility for the physical and financial care of the mother. The patient's wife refused, and bitter quarrels ensued in which Dr. N. was torn between his inclination to help his mother and his wife's adamant

refusal. He was unable to take any effective part in the conflict. It was during this time that his symptoms became disturbing. In 1953, following the illness and death of the eldest brother, the family conflict increased markedly. Late in 1953, the patient consulted a local psychiatrist who hospitalized him and then referred him to a psychiatrist in the states. In the United States he received EST and psychotherapy and returned home after about four months feeling much better. However, during the summer the symptoms recurred, and he was referred to St. Louis where he was admitted to the hospital in August, 1954. On admission the patient appeared depressed. He told his story coherently, at considerable length and with great attention to detail. In brief, psychological tests indicated that factors impairing optimal performance in this patient were an overly concrete and meticulous approach to tasks, egocentricity, and deficiency in ego control accompanied by marked but repressed hostility. Patient was treated with electroshock therapy, with a total of 9 grand-mal convulsions. During this hospitalization the depression lifted, and there was less compulsive rumination about his troubles. However, preoccupation with somatic difficulties persisted. He was discharged in November from the hospital after two months and went to live with his nephew in the city. He was seen in psychotherapy regularly while in the hospital, and until he returned home in late January, 1955.

The Psychotherapeutic Problem

Dr. N. had lived so long in a cosmopolitan society and had associated extensively with Americans so that there was practically no difficulty with language.

It was expected that there would be some difficulty in establishing a profitable therapeutic relationship with this patient, not only because he came from a culture so different from that of his doctor, but from one in which the traditional attitude toward the sexes might make it hard for him to accept help from a woman. For this reason, and also because one of the authors (M. M. B.) first saw the patient when he was still receiving EST, psychotherapy for several weeks was confined to developing a comfortable relationship without any attempt to investigate specific problems. During this period he was visited daily, and discussion ranged from geography and customs of the islands and of Japan to a general family history, in which the patient carefully avoided any emotionally charged topics. Sometimes the daily visit was deliberately made in the occupational therapy workshop so the therapist could further demonstrate an attitude of friendly interest in his activities. Offers were made to obtain medical journals from the library, and to arrange visits to the clinics if the patient desired. Especially appreciated by Dr. N. was an introduction and visit to an eminent professor and compatriot, Dr. T. During this initial period the patient's behavior was one of impeccable oriental courtesy with minimal emotional coloring. At the end of the first week there was for the first time a transitory gleam of respect and appreciation when the therapist revealed some knowledge of Japanese history. An informative opportunity for discussion was provided by a record of classical Japanese music. One ballad described a wrestler who in spite of his wife's pleading was considering a bribe with which he could support his aging parents. When the situation was presented to the patient in the manner of a psychological projective test, he stated firmly that the man should accept the bribe and then commit suicide. The wife, he felt, was pleading not primarily because she foresaw suicide but because she feared her husband's dishonor. In this situation, as well as in others, the patient demonstrated that he still maintained values and attitudes derived from Japanese culture. This is consistent with the carry over of tradition as reported in Plains Indians by Devereaux (2) and in Nisei by Handley (3). The introductory period of therapy lasted for about three weeks. During the course of treatment it was often difficult for the therapist to feel emotional rapport with the patient, and she often felt as if she were being treated with more courtesy than candor. As time went on, she developed more sensitivity to the nuances of feeling, and she deliberately encouraged freedom of expression by accepting differences of opinion both generally in the field of national questions and specifically as related to his problems. The patient became somewhat more expressive

and comfortable in the interview situation. He was never able to express his feelings directly to the therapist about having a woman for a doctor; however, after the therapist's discussing this with Dr. T., and latter reported with some surprise that this did not seem to be as much of an obstacle as had been anticipated.

An attempt was made to consider this man's problems relative to the description of Japanese character rather than to expected American behavior. For instance, it was recognized that a rather high degree of compulsiveness, conformism, and perfectionism was to be expected rather than considered evidence of maladjustment. Only the areas in which these tendencies seemed exaggerated to an incapacitating degree were considered in therapy. As his condition improved, the patient recognized that his passion for perfection in medical practice had become unreasonable, impairing rather than enhancing his efficiency. The problem of suppressed hostility was also considered in part a national characteristic, and was not dealt with except in the direction of encouraging and accepting as much verbal resentment as he could manage. This was chiefly an expression of anger toward his wife. He also became able to criticize some of the therapist's American customs, e.g., immoderate generosity vs. oriental thrift, and after a time could correct the therapist when he thought that she had misunderstood him.

Although initially Dr. N. believed that his major problem was in his difficulty in practicing his profession, he came to realize that much or most of his serious conflict had arisen at home, with secondary effect upon his work. His problem was seen in part as that of a man who since the early death of his father had been strongly influenced by a succession of dominant women, his mother, his sister-in-law, and his wife. His relationship to his wife was further complicated by her less traditional Japanese upbringing. While he had previously been able to get along effectively in a passive manner, he had never assumed his role of the traditional Japanese lord of the household. Such conflict over dependency would be expected to be more severe in one of his nationality than it might in a less patriarchial culture. While it was initially difficult for Dr. N. to discuss his relationship to significant women in his life, he seemed to gain a confidence by contact with a sympathetic, non-judgmental woman, who showed respect not only for him as a man but who recognized and accepted that his cultural expectations of a woman's world might differ from that of his doctor's. He was never able to admit openly the superior prestige of male siblings over their sisters, but he did not contradict when this was assumed by the therapist in discussion. The wife had three older sisters and one younger brother with whom she continually quarrels. It was suggested that the jealousy of the boy whose advent probably reduced the prestige of his elder sister might be carrying over into the marriage as the wife continued her early pattern of trying aggressively to compete with her husband for control. This speculation by the therapist appealed to the patient as he referred to it twice in later interviews. The meaning for him seemed to be that her aggressiveness was a little more acceptable since he felt it was partly an expression of her own insecurity rather than entirely due to hostility toward him. This theme was further developed as her apparent difficulties in handling other interpersonal situations were explored. At least on the verbal level he recognized that she might respond to some real support from him. Since the wife lived thousands of miles away and since he interpreted her letters as indicating increasing sympathy and warmth toward him, during the latter weeks of therapy he found it increasingly difficult to apply himself to working on the marital problems since they seemed rather remote to him, and he professed a belief that perhaps they would not recur as intensively as they had prior to his illness. An understanding of the Japanese attitude toward obligation was particularly useful in dealing with this patient. When he left the hospital, he was invited to stay with his nephew who lives in St. Louis. The nephew is the son of the patient's eldest brother, and is much more Americanized than the patient. He had considerable insight into his uncle's problems and displayed genuine warmth toward him. Dr. N. was initially quite loathe to accept the invitation for a prolonged visit. He felt that the invitation might be more courteous than

cordial, and was hesitant to impose. He worried about the incurred obligation and was concerned about ways in which he could repay it. No real attempt was made to analyze or question his concept of obligation and repayment since it was felt that it was to be expected from his tradition. Instead ways were discussed in which Dr. N. could become more comfortable in accepting the offered hospitality. Numerous visits from the hospital apparently convinced him that he was really welcome. Both before he left the hospital and afterwards, time was spent considering ways in which he could repay his debt. Originally he suggested that a money payment for the wife would be most suitable. He was led to think of other more personal ways to help and please the younger family. This was done in part to help him deal with the immediate situation and in part as an approach to the larger problem of personal interaction. He immediately found ways to make himself useful in the home, and apparently felt no loss of dignity by assisting with dishwashing and assuming other household chores and repair work. He also helped care for the seven-year-old son. His feelings of obligation increased at Christmas time. This led to a more general consideration of personal involvement in relationships with his wife and others as opposed to mechanical provision of material things. It had been hoped that some of the personal difficulties that forced the patient into trouble at home might assert themselves during his visit, providing immediate material for therapy in contrast to the marital problem which by that time seemed less urgent to the patient. However, since he was the honored guest, things went smoothly. One of the most fruitful aspects of his visit seemed to be his contact with the seven-year-old boy. The little boy, being friendly and used to his father's attentions, actively invited the patient to participate in reading to him and playing games with him, and it was felt that this development of a more warm, active interest in the child was not an imposition of Occidental values but was consistent with the described role of the Japanese father who combined authority with genuine personal concern. Dr. N. had never done this with his own son, but found that he enjoyed it, and it was hoped that he would carry this new experience over into his life at home. Dr. N. stayed two months with his nephew. His somatic concerns steadily diminished, and his feeling of strength and self-confidence increased so that he felt capable of returning home and resuming practice. At the time of this writing the nephew reports that the patient is apparently getting along well at home and at work.

Summary

1. A case report is presented and discussed to illustrate the problem of psychotherapy by a doctor of one culture with a patient of quite a different background, in this case an American woman psychiatrist with a Japanese male physician.

2. In order to understand his problem better and to treat him more effectively, Japanese culture patterns were studied, and a brief summary is included in this paper.

3. The patient, who had an involutional depression, was treated initially with EST which relieved the depressive features. This was accompanied and followed by psychotherapy in an attempt to help him deal more satisfactorily with his interpersonal relationships.

4. The problems of cross-cultural psychotherapy include the dangers of mutual misunderstanding and of an attempt of the therapist to impose values and goals which although appropriate in his society might be unsuitable for the patient. It was felt that in this case a constant awareness of Japanese culture patterns on the part of the psychiatrist made therapy much more acceptable and meaningful to this patient.

5. It is suggested that if more attention were paid to the cultural backgrounds of patients, psychotherapy might be adapted more flexibly to meet the needs of the many national and social groups within our country instead of being as it so frequently is, an interaction between doctors and patients both of the same nationality and social class.

BIBLIOGRAPHY

1. Benedict, R.: *The Chrysanthemum and the Sword.* Boston: Houghton Mifflin Co., 1946.
2. Devereaux, G.: Three technical problems in psychotherapy of plains indian patients. *Am. J. Psychotherap., 5:* 411–423, 1951.

3. Handley, K. N.: Social casework and intercultural problems. *J. Social Casework, 28:* 43–50, 1947.
4. Jacobsen, A., and Berenberg, A. N.: Japanese psychiatry and psychotherapy. *Am. J. Psychiat., 109:* 321–329, 1952.
5. Kinsey, A. C.: *Sexual Behavior in the Human Male.* Philadelphia: W. B. Saunders Co., 1948.
6. La Barre, W.: Some observations on character structure in the Orient. *Psychiatry, 8:* 319–342, 1945.
7. Maloney, J. C.: Understanding the paradox of Japanese psychoanalyses. *Internat. J. Psychoanal., 34:* 291–303, 1953.
8. Maloney, J. C.: What every American should know about Japan. *Mil. Surgeon, 110:* 106–115, 1952.
9. Mueller, E. E.: An experience with group psychotherapy in Japan. *Am. J. Psychotherapy., 4:* 293–302, 1950.
10. Neavles, J.: Personal communication.
11. Robinson, H. A., Redlich, F. C., and Myers, J. K.: Social structure and psychiatric treatment. *Am. J. Orthopsychiat., 24:* 2, 307–316, 1954.
12. Ruesch, J.: *Psychiatric Treatment.* Proceedings of the Association for Research in Nervous and Mental Disease, Vol. XXXI, 1953.

Department of Neuropsychiatry
Washington University
St. Louis 10, Missouri

PARENCHYMATOUS CORTICAL CEREBELLAR ATROPHY[1]

PAUL CHODOFF, M.D., THOMAS AUTH, M.D., AND HENRY TOUPIN, M.D.

The condition known as "parenchymatous cortical cerebellar atrophy" (16) or by any of a variety of very similar names (cortical cerebellar degeneration (8), chronic progressive degeneration of the superior cerebellar cortex (4)), after being the subject of a number of case reports (2, 7, 14, 19, 21), was isolated as a clinico-pathological entity by Marie, Foix and Alajouanine (10) in 1922. They described the disorder as coming on after the age of 40, usually with a gradual onset and slow progression and without significant remissions. Ataxia was always more prominent in the legs and body than in the upper extremities, the gait being characteristically reeling and drunken. Nystagmus and speech disturbances were rare. Pathological findings in autopsied cases showed symmetrical atrophy of the cerebellum particularly involving the superior and anterior portions of the vermis and adjacent lateral lobes. Histologically, the Purkinje cells were almost selectively involved often being entirely absent in the most affected lobules. Greenfield (6), in a recent monograph, points out that the paleo and archicerebellum are chiefly involved and that the principal symptom of gait disorder is correlated with lesions in the flocculus and superior vermis.

The more recent literature has contained comparatively few accounts of the disorder. Parker and Kernohan (16) collected 11 cases previously reported along with one of their own. Three cases were added by Lhermitte (8) in 1935, and in 1940 the pathology and pathogenesis were discussed by Courville and Friedman (4) along with an additional case. Romano, Michael and Merritt (18) described five cases all occurring in alcoholic males, and a recent article by Skillicorn (20) also attributes six cases of the syndrome, found within a period of six months in a Naval hospital, to alcoholism. In general the condition appears to be considered quite rare, a curiosity of obscure and anomalous position among the more common and better documented hereditary cerebellar disorders.

There has been no agreement and a certain amount of controversy concerning etiology. Richter (17) and Akelaitis (1) have described familial cases, but hereditary influence does not appear to be of importance in most patients. A large number of etiological factors causing cerebellar degeneration have been suggested or implicated in individual instances. As summarized by Greenfield (6), these include extracranial carcinoma, enteritis, syphilis, tuberculosis, alcoholism, trauma, heat stroke, endocrine disturbances, vitamin deficiency, lead and methyl mercuric salts. Parker and Kernohan (16), on pathological grounds, suggested that certain cases with a subacute course might be due to the virus of louping ill, an endemic disease of sheep. This has not been confirmed. Skillicorn (20) adds sensitivity to some drugs, acute rheumatic fever, and post-thyroidectomy crisis as factors to which damage to the cerebellum has been attributed.

The principal disagreement has been about the role of alcohol in the pathogenesis of the disorder. As mentioned, in the cases described by Romano, Michael and Merritt (18) and by Skillicorn (20), chronic alcoholism appeared to be the most prominent etiological factor. A review of the other case reports in the literature reveals that alcohol is implicated by some but by no means all of the authors and that some deny its importance. Victor and Adams (22) feel that the alcoholic etiology of cerebellar degeneration is unacceptable and suggest that the cases described by Romano *et al.* may actually be either familial with inadequate histories or sporadic instances of a usually familial disorder. Courville and Friedman (4) point out that the anatomical location of the lesion (superior surface of the cerebellum) as well as the rarity of the disease as contrasted with the frequency of chronic alcoholism argues against the importance of alcohol as an etiological factor. Parker and Kernohan (16) also emphasize the disproportion between the common use of alcohol and the infrequent occurrence of cere-

[1] From the Department of Neurology, George Washington University Medical School (Dr. Chodoff), and the Department of Neurology, Georgetown University Medical School (Dr. Auth and Dr. Toupin), and from the Veterans Administration Hospital, Washington, D. C., and D. C. General Hospital.

bellar degeneration. Greenfield (6) feels that alcohol, although a common cause of cerebellar symptoms during the acute stage of intoxication, very rarely causes lasting damage to the cerebellar cortex. Two current reference works on neurology (3, 12) mention but do not emphazise alcohol among other possible etiologies of this variety of cerebellar degeneration.

This investigation was undertaken because the authors were impressed by the apparently not at all infrequent occurrence of cases of a well-defined syndrome of cerebellar gait ataxia occurring in alcoholic males in the city and Veterans hospitals in Washington, D. C. Accordingly, in addition to patients with the disorder currently on the wards during the period of investigation, a search was made in the record rooms of the Veterans Administration Hospital and the D. C. General Hospital for all cases who had been discharged with the diagnosis of cerebellar sclerosis, olivopontocerebellar atrophy or parenchymatous cortical cerebellar atrophy during the past five to eight years. It was found that the latter diagnosis was the only one under which cases had been recorded, none at all being diagnosed under the first two rubrics. This may be that what is meant by cerebellar sclerosis is not at all clear while olivopontocerebellar atrophy appears to be more of a pathological than a clinical diagnosis although a number of cases of the latter disease characterized by a combination of cerebellar ataxia and Parkinsonian symptoms have been reported.

A total of 24 cases diagnosed as parenchymatous cortical cerebellar atrophy was found in the two hospitals. Of these, six were eliminated either because the diagnosis appeared doubtful or because the description of the case was inadequate. If there appeared to be any possibility that the ataxia was due to impairment of position sense in patients showing signs of peripheral neuropathy, the case was not used.

There remained 18 cases in which it was felt that the diagnosis was accurate and in which there was sufficient information available for analysis. Except for one colored female 19 years of age, all patients were male; 13 white and five colored. They ranged in age from 19 to 64, and if the 19-year-old female is left out, the next youngest was 35. Three patients were in their thirties, seven in the forties, four in the fifties, and three in the sixties.

The most prominent finding and one present in all cases was a marked cerebellar gait disorder with truncal ataxia and impairment of performance of the heel to knee test. This varied in severity but in each instance was more or less incapacitating sometimes to a very considerable degree. Other neurological abnormalities included the following: nystagmus, 4 cases; dysarthria, 3 cases; optic atrophy, 1 case; ataxia of the upper extremities, 8 cases; hyperactive reflexes or pathological reflexes, 3 cases; involuntary movements, 1 case. There was a prior history of convulsive episodes in two patients. In eight cases there were evidences of peripheral neuropathy in the form of diminished or absent ankle jerks and impairment of sensation over the peripheral portions of the lower extremities. In none of these was there significant interference with position sense, and as has been mentioned some cases have been excluded from consideration because it was felt that position sense loss may have been responsible for the gait disorder. It should be emphasized that the difficulty in locomotion was always the chief complaint and that the other findings listed above were distinctly subordinate.

In most cases it was difficult to obtain an accurate detailed history of the onset and development of the symptoms. The condition had been present for less than a year in six cases while the others had been aware of trouble in walking for from one to ten years. Except for two patients with acute onsets (cases 3 and 4) the beginning of symptoms was quite gradual. The usual picture was that of the slow onset of a wide based unsteady gait which progressively became worse or remained unaltered after a period of progression. In no instance was there a significant remission after the difficulty definitely had become established.

There were no characteristic abnormal laboratory findings. Lumbar punctures were done in all cases, and aside from borderline elevation of the protein in four patients, spinal fluids were within normal limits. Blood and spinal fluid serologies were uniformly negative. Electroencephalographic tracings were available in seven cases; of these two were reported as normal, one as borderline, one as abnormally fast, two as showing a generalized abnormality, while in one there was a right temporal focus

(this patient was epileptic.) Pneumoencephalograms were made in 11 cases. Unfortunately we were able to review only four of these. The characteristic findings indicative of cerebellar atrophy (13), which Skillicorn (20) reported to be present in all six of his cases, were not seen definitely in any of these although a suggestively enlarged cisterna magna was present in one instance. In two of the cases in which films were not available to us, the roentgenologist had felt that cerebellar atrophy could be seen. Mild degrees of symmetrical ventricular dilatation were reported in five cases.

Among possible causes of the syndrome seen in these patients, alcohol stood out prominently. Most of the individuals reported were severe chronic alcoholics whose records showed many arrests for drunkenness and hospitalization because of delirium tremens and other complications of ethanol. Generally, the history of excessive drinking was of many years standing, up to 35 or 40. In one case the patient was known to be a moderately heavy week-end drinker but probably could not be considered a chronic alcoholic. In the 19-year-old colored female (case 5) the etiology was obscure since there were conflicting histories concerning her drinking habits. This patient had been taking dilantin for three or four years because of a convulsive state, and the possibility was noted that she may have taken an overdose and that the toxic effects of the drug were responsible for the impairment of cerebellar function (11). One other patient, a known alcoholic, had also been taking dilantin for treatment of convulsions, but here there was no reason to believe that the drug had had any toxic effect. In one patient (case 4), although he was known to be alcoholic, the cause of his cerebellar syndrome seemed quite clearly to be heat stroke. This case has been reported elsewhere by Freeman and Dumoff (5). Thus of the 18 cases reported, alcohol was the only demonstrable etiologic factor in 16 while one was due to heat stroke and in another no cause could be established definitely although both alcohol and dilantin may have been implicated. In no case in this series was there a positive family history of any neurological disorder.

Illustrative Case Histories

Case 1: M. B., a while male, 47 years old, was admitted to Veterans Administration Hospital, Washington, D. C., on July 19, 1955. His difficulty in walking had begun two to three years prior to admission and had progressed to the point that in the previous year he was able to work half days only. He had stopped work entirely three months before admission. He had drunk heavily for many years, especially from 1948 to about 18 months before admission, and had a record which included at least 10 arrests for drunkenness. There was no history of any other toxic exposure nor was there a family history of any similar disorder.

Examinations showed prominent cerebellar gait ataxia with compass turning. There was marked ataxia on heel to knee and toe to object tests especially on the right. There was no nystagmus, upper extremity ataxia, speech disorder or sensory abnormalities.

Skull X-ray and EEG were within normal limits. Lumbar puncture pressure was 90 mm. of H_2O. There were no cells, a protein of 39 mg.%, a flat gold curve and negative serology. Pneumoencephalogram showed only slight dilatation of the lateral ventricles.

Case 2: E. L. K., a 61-year-old white male, was admitted to Veterans Administration Hospital, Washington, D. C., on January 6, 1955, with a history of a gait disorder which had begun insidiously in about 1949. In 1950 he began to ride streetcars rather than walk because of accusations of intoxication, and he was forced to retire from work in 1952 because of progression of the disorder. He fell many times at home in the period from 1952 to 1954; the family believed his condition had been stationary for the past year. There was no family history of ataxia or of any neurological disorder. The patient had been a heavy beer drinker for 30 years until four years prior to admission with a minimum daily intake of five beers.

The gait was markedly ataxic and broad based. There was less marked ataxia of the upper extremities with decomposition of movements on finger to nose test and inability to write legibly. There was no nystagmus, but slight dysarthria was present. Corticospinal and sensory tract signs were absent, and there were no reflex changes except for hypoactive Achilles reflexes.

Skull X-ray and lumbar puncture were within normal limits. Pneumoencephalogram was refused by the patient.

Comment: The history and findings in these two cases are typical of the large majority of the cases reported here with gradual development of a cerebellar gait disorder supervening after many years of heavy drinking. In case 1 there were no findings other than the wide based gait and heel to knee ataxia, while in case 2 there was also some rather mild ataxia of the upper extremities and dysarthria.

Case 3: C. E., McS., a 59-year-old white male, was first admitted to Veterans Administration Hospital, Washington, D. C., on June 29, 1951, with complaints of inability to walk, diarrhea, sore tongue and itching of the skin. Prior to two years before admission the patient had been a moderately heavy drinker. During the preceding two years he had been in Manila where his diet had been poor and where the tempo of his drinking had very markedly accelerated. For several

weeks before admission he had been going to farewell parties almost every night and during this period developed right foot drop and ataxia of the lower extremities. Examination at that time revealed trophic ulcers of both buttocks and of the lower extremities, a red, smooth and sore tongue, weakness of the muscles supplied by the right peroneal nerve with an absent right Achilles reflex and a broad based ataxic gait requiring assistance.

Skull X-rays were normal. Spinal fluid was within normal limits except for a protein of 69 mg.%. Pneumoencephalogram revealed no significant abnormalities.

The patient's condition improved with massive vitamin therapy, but there was little improvement in walking. He was discharged on October 4, 1951, able to walk with a cane. On re-admission on June 6, 1952, examination revealed no impairment of strength in the right lower extremity. The gait was, as before, wide based and ataxic. The right ankle jerk was absent, and vibration sense was lost over both legs. Position sense was intact, and there was no other sensory impairment. Spinal fluid protein was now 37 mg.% and EEG was normal.

Comment: This case and one other with a somewhat similar history are of considerable interest because of the acute or subacute onset precipitated by heavy drinking and poor diet. The diagnosis of pellagra was made on his first admission accompanied by a right peroneal nerve palsy. The cerebellar signs appeared at the same time but persisted after the acute manifestations had cleared up and were relatively unchanged at the time of his second admission eight months later when the muscular weakness had disappeared. It is difficult to escape the conclusion that the same agent that was responsible for the transient pellagrous and neuritic manifestations was also the cause of the persistent cerebellar defect.

The following two cases differ in some respects from the others included in this series but share with them the characteristics of being non-familial instances of cerebellar disease occurring in adult life with a toxic basis which is definite in one case but only possible in the other.

Case 4: J. G., a 46-year-old white male, was admitted to the D. C. General Hospital (formerly Gallinger Municipal Hospital) on October 15, 1942. There was a history of a heat stroke in 1926 which was of sufficient intensity to keep him in bed for two days but which produced no sequelae. He next came to medical attention on August 8, 1937, when he was admitted to Emergency Hospital, Washington, D. C., with an axillary temperature of 108°F. After treatment for heat stroke he gave a history of working out of doors in a temperature of 106°F. on the previous day. He experienced a vague feeling of illness and drank three bottles of beer, but the rest of the day felt unable to work. Despite the ingestion of large quantities of water he did not perspire. His mind was clear until he fell to the floor on the evening of the day following his exposure. The patient was known to be a chronic alcoholic.

Examination showed marked nystagmus, dysarthria and intention tremor and poorly coordinated movements along with severe gait ataxia. He was reexamined at periodic intervals in the ensuing years and on these occasions showed no significant improvement. In October, 1942, he was able to take one or two steps unsupported with a wide based unsteady gait. In addition to cerebellar signs in both upper and lower extremities, he showed a fixed facial expression with drooping of the right corner of the mouth, and involuntary movements of the tongue, lips and hands.

Comment: The occurrence of cerebellar damage after heat stroke has been well documented. In this case which has been reported in detail elsewhere (5), although the main symptomatology was cerebellar, there was evidence of wide-spread damage to the central nervous system. The fact that the patient was a chronic alcoholic does not appear to have a direct bearing on the pathogenesis in this instance.

Case 5: V. G., a 19-year-old colored female, was admitted to D. C. General Hospital (formerly Gallinger Municipal Hospital) on September 29, 1953, with a history of difficulty in walking for the previous five or six months. At the age of 11 she had begun to have generalized convulsive seizures with a focal onset in the left hand and these had continued. In April, 1951, she was placed on dilantin 0.1 gm., t.i.d., which produced satisfactory control of the seizures. For the past several years, during which time she had had a 5–6 month miscarriage, the patient had been living with her sister who, according to their father, is a severe alcoholic. He reported that the sister drank 2–3 pints of whiskey per day, and that the patient would drink along with her. At another interview the sister denied that she or the patient drank heavily. The patient herself was considered unreliable on this matter and appeared to be of dull intelligence. There was no definite history of dilantin overdosage, but this was considered to be a possibility. There was no family history of neurological disease.

The gradual difficulty in maintaining her balance had begun about six months previously and had progressed until the time of admission. Examination revealed a marked cerebellar syndrome with nystagmus, intention tremor and incoordination of the upper extremities, truncal ataxia, and a broad based unsteady gait. Aside from diminished reflexes in the lower extremities there were no other positive neurological findings. There were no significant laboratory abnormalities. The EEG revealed a right temporal focus. A pneumoencephalogram was done and was considered to be within normal limits. The patient was discharged on January 19, 1954, and was followed in the Neurological Clinic. In the Spring of 1955 her condition was reported to be essentially unchanged.

Comment: This case differs from the others reported by us and might be considered an atypical, sporadic instance of Friedreich's ataxia. However, the absence of typical findings of this disease, the age of onset and the negative family history appear to justify its inclusion as a borderline case between the hereditary

cerebellar ataxias and the group we are reporting here. Although there is no definite etiological factor, the possibilities are noted that alcohol or dilantin toxicity or sensitivity may be implicated.

Discussion

The syndrome described in this paper can be summarized as the development of a cerebellar disorder chiefly involving the lower extremities, with less regular and severe involvement of other central nervous system structures, as the result of the effect of toxic influences of which alcohol is by far the most important. It appears to us that the arguments for the alcoholic etiology of most of these cases are overwhelming. The fact that the large majority of these patients are chronic severe alcoholics must certainly be given weight. The sequence of events in case 3, which can be duplicated in at least one other case, suggests very strongly that the factors responsible for the other manifestations shown by the patient were also the cause of his cerebellar signs. Whether the alcohol acted directly or by virtue of its effect in interfering with nutrition and vitamin intake, is an argument familiar to us also in the instance of alcoholic polyneuropathy. It seems probable that both effects may play a role.

It is accepted that the chief micropathological finding in cases of this syndrome which have come to autopsy is the damage to the Purkinje cells of the cerebellar cortex. The sensitivity of these cells to anoxia, ischemia and many other conditions is well known. That alcohol markedly affects the cerebellum is attested to by the staggering gait of every acute alcoholic, and it requires no great stretching of the imagination to believe that repeated insults of this kind can result in irreversible changes in these vulnerable cells and in permanent functional damage. Myers and Courville (15) point out that the effects of alcohol resemble those of anoxia, that alcohol produces first reversible, then irreversible, changes in the brain cells and that the Purkinje cells are prominently affected. They describe alcoholic degeneration of the cerebellum as a definite entity but suggest that associated nutritional factors may be necessary to produce the disease. This is also suggested by the work of Lhermitte, de Ajuriaguerra and Garnier (9) who demonstrated cerebellar damage in rabbits fed alcohol daily and unprotected by vitamin supplements.

Certain objections have been raised to the theory of the predominantly alcoholic etiology of this syndrome. In view of the great frequency of alcoholism it has been asked why the condition occurs so infrequently. We feel that cerebellar degeneration of this type is quite possibly more common than has been thought. It may be that a not inconsiderable number of these cases have been masquerading under such diagnoses as peripheral neuropathy, multiple sclerosis and cerebral arteriosclerosis. As to the reason why even more alcoholics do not develop the syndrome, we have no good answer but can point out that this is a kind of problem not at all uncommon in medicine. It may be partly a question of the degree of the toxic insult, and it seems likely that in most cases some other factor is necessary. This may be nutritional, or it may be that something like the concept of abiotrophy will have to be invoked.

It has also been stated as an objection to the theory of alcoholic pathogenesis that cases of this kind are reported only from hospitals in which alcoholism is a frequent problem. This appears to be confirmatory rather than in opposition to the theory since it is only from such hospitals that reports of this entity have appeared in recent years. In going over the rather mixed bag of cases in the earlier papers, it can be seen that many of them resemble the type of case reported here.

Although we feel that alcohol is responsible for the great majority of cases of the syndrome here described, it should be emphasized that we do not consider it to be the only etiologic agent. It seems likely that many of the causes previously listed as being responsible for damage to the cerebellum, particularly to the Purkinje cells of the cortex, can produce the clinical picture we have discribed. This is illustrated by case 4 which was caused by heat stroke and by case 5 where the possibility of dilantin toxicity or sensitivity had been raised. Case 5 also suggests that the etiologic factor may not always be obvious and that there will be cases in which differentiation from the hereditary cerebellar ataxias will be difficult.

Finally, it seems pertinent to comment on the diagnostic title of the syndrome and its nosological position in the general category of degenerative cerebellar disorders. In his mono-

graph, Greenfield (6) makes a distinction between "late cortical cerebellar atrophy" and diffuse degenerations of the cerebellar cortex on the basis of whether the Purkinje cell atrophy is localized or diffuse, with the former condition being considered either familial, or at least without a specific etiology, while the latter is attributed to any of a number of agents including infection, carcinoma and alcohol. In the absence of pathological material, we are unable to comment on the distribution of the cerebellar atrophy in these patients. On the basis of the cases reported here and after surveying the recent literature, we feel that it is doubtful whether a primary and a secondary form of non-familial cerebellar degeneration of late onset can be distinguished, and we suggest that most cases of primary parenchymatous cerebellar degeneration are of toxic origin and that the toxin involved in the large majority of cases is alcohol. If this view is upheld, it would seem wise to drop this diagnosis and to substitute for it the title of delayed cerebellar degeneration, familial or non-familial with a notation of the responsible etiological agent wherever possible in non-familial cases.

Summary

The literature on the condition known as parenchymatous cortical cerebellar atrophy is reviewed. Whereas there is fairly good agreement on the clinical characteristics and pathological background of the syndrome, there has been a lack of accord on its nosological position and on its etiology. Only in recent papers is the role of alcohol emphasized.

Eighteen cases of the disorder, currently or during the past five to eight years at the Veterans Administration Hospital, Washington, D. C., and the D. C. General Hospital, are reported in this presentation. Aside from a 19-year-old colored female who presented a borderline picture also suggesting the possible diagnosis of Friedreich's ataxia, all patients were males ranging in age from 35 to 62. In all patients, a prominent cerebellar gait ataxia was the most prominent finding although other evidences of cerebellar disease were also present in some. There were no characteristic laboratory or X-ray findings.

In 16 of the patients there was a history of prolonged alcoholic overindulgence which was felt in these cases to be the etiological agent responsible for the development of the disease. The reasons for this are discussed, and the controversy over the role of alcohol is reviewed. In one case heat stroke was the cause of the condition, and in one the etiology was obscure. Illustrative case histories are given.

The limiting criteria of the syndrome described in this paper are as follows: 1) it is non-familial; 2) the onset is in adult life usually middle age; 3) the outstanding clinical feature is a cerebellar ataxia of the gait; 4) it is usually associated with a demonstrable toxic factor most often alcohol. Doubt is expressed whether a primary and secondary form of delayed cerebellar degeneration can be distinguished on clinical grounds in non-familial cases. The suggestion is made that instances of degenerative cerebellar disease coming on in adult life be classified under the heading of delayed cerebellar degeneration, familial or non-familial, and that the responsible etiological agent be listed wherever possible.

Bibliography

1. Akelaitis, A. J.: Hereditary form of primary parenchymatous atrophy of cerebellar cortex associated with mental deterioration. *Am. J. Psychiat., 94:* 1115, 1938.
2. Archambault, LaSalle: Parenchymatous atrophy of the cerebellum. *J. Nerv. & Ment. Dis., 48:* 273, 1918.
3. Baker, A. B. (Editor): *Clinical Neurology.* New York: Hoeber-Harper, 1955, pp. 1251–1252.
4. Courville, C. B., and Friedman, A. P.: Chronic progressive degeneration of the superior cerebellar cortex (parenchymatous cortical cerebellar atrophy). *Bull. Los Angeles Neurol. Soc., 5:* 171, 1940.
5. Freeman, W., and Dumoff, E.: Cerebellar syndrome following heat stroke. *Arch. neurol. & Psychiat., 51:* 67, 1944.
6. Greenfield, J. G.: *The Spino-Cerebellar Degenerations.* Springfield, Illinois: Charles C. Thomas, 1954.
7. Jelgersma, G.: Eine Systemerkrankung in Kleinhirn. *J. f. Psychol. u. Neurol., 25:* 42, 1919.
8. Lhermitte, J.: Cortical cerebellar degeneration. *Proc. Roy. Soc. Med., 28:* 379, 1935.
9. Lhermitte, J., de Ajuriaguerra, and Garnier: Les Lesions du Systeme. Nerveux dans L'Intoxication Alcolique Experimental. *Compt. rend. soc. de biol., 128:* 386, 1938.
10. Marie, P., Foix, C., and Alajouanine, T.: De l'Atrophie Cérébelleuse Tardive à Prédominance Corticale. *Rev. Neurol., 27:* 797, 1922.
11. Merritt, H. H., and Putnam, T. J.: Sodium diphenyl hydantoinate in the treatment of convulsive disorders: Toxic symptoms and their prevention. *Arch. Neurol. & Psychiat., 42:* 1053, 1939.
12. Merritt, H. H.: *Textbook of Neurology.* Philadelphia: Lea and Febiger, 1955, pp. 463–464.

13. Murphy, J. P., and Orana, R.: The pneumoencephalogram of cerebellar atrophy. *Am. J. Roentgenol., 57:* 545, 1947.
14. Murri, A.: Degenerazione Cerebellare de Intossicazione Enterogena. *Riv. Crit., di Clin. Med., 1:* 593, 1900.
15. Myers, R. O., and Courville, C. B.: Effects of extraneous poisons on the nervous system. II. The alcohols. *Bull. Los Angeles Neurol. Soc., 19:* 66, 1954.
16. Parker, H. L., and Kernohan, J. W.: Parenchymatous cortical cerebellar atrophy (Chronic atrophy of Purkinje's cells). *Brain, 56:* 191, 1933.
17. Richter, R. B.: A clinico-pathological study of parenchymatous cortical cerebellar atrophy. *Trans. Am. Neurol. A., 64:* 21, 1938.
18. Romano, J., Michael, M., and Merritt, H. H.: Alcoholic cerebellar degeneration. *Arch. Neur. & Psychiat., 4:* 1230, 1940.
19. Rossi, I.: Atrophie Primitive du Cervelet à Localisation Corticale. *Nouv. Icon. de la Salpêtriere, 20:* 66, 1907.
20. Skillicorn, S. A.: Presenile cerebellar ataxia in chronic alcoholics. *Neurology, 5:* 527, 1955.
21. Thomas, A.: Atrophie Lamellaire des Cellules de Purkinje. *Rev. Neurol., 13:* 917, 1905.
22. Victor, M., and Adams, R. D.: The effect of alcohol on the nervous system. *Res. Pub., A. Res. Nerv. & Ment. Dis., 32:* 526–573, 1953.

1904 R Street, N.W.
Washington, D. C.

INVESTIGATIONS ON THE GLYOXYLIC ACID REACTIONS ON URINES FROM SCHIZOPHRENICS AND OTHER PSYCHOTIC PATIENTS

L. M. RIEGELHAUPT, M.Sc.

In continuation of earlier research at this department, concerned with the problem of toxic substances, possibly arising from, or in connection with, disturbances of the protein metabolism of schizophrenics (4), investigations were made on the behavior of urine from psychotic patients.

Disturbances of the albumin-globulin quotient in serum and C.S.F., together with other biochemical and clinical conditions, are according to earlier workers characteristic, though not specific, of schizophrenia (3). Are these disturbances accompanied by irregularities in the excretion pattern of urine? In order to obtain an answer to this question, it was decided to investigate urines of psychotic patients for the presence of amino acids and their metabolites. A start was made by studying the behavior of urines in the glyoxylic acid test for the tryptophan group (6).

Material

Urine specimens were received from 120 patients and 12 healthy adults. Sixty-five patients were unclassified schizophrenics, and the diagnoses of the 55 non-schizophrenics were as follows: mental deficiency, 8; dementia, 4; depression, 6; manic depressive psychosis, 4; paretic neurosyphilis, 10; epilepsy, 15; hypochondria, 3; obsessional neurosis, 2; and personality disorder, 3.

Method

Urine samples, voided in the morning, were tested a few hours later. Some of the tests were repeated with samples of urine collected from the same patients on different days or at different hours of the same day. The diagnoses of the patients were not known prior to the conclusion of the tests.

Two ml. of filtered urine were well mixed with 1.0 ml. of glyoxylic acid. Then 1.0 ml. of concentrated sulphuric acid was allowed to flow slowly—approximately within 20 seconds—down the side of the test tube, thus allowing to form a sharply defined layer beneath the mixture. When stratified in this manner, a reddish-violet color forms at the zone of contact of the two liquids, if the reaction is positive. The intensity of the color varies with the amount of reactive substance present.

All urine samples were tested by the glyoxylic acid test. A number of samples was also tested for protein by the sulphosalicylic acid test. To 2.0 ml. of filtered urine were added 3 to 4 drops of 20 per cent sulphosalicylic acid solution. The urines thus treated were compared with the same urines untreated, as controls.

Since the sulphosalicylic acid indicated the presence of protein in a number of tests, it was of interest to find out how these urines behave in the glyoxylic acid test after precipitation and removal of the protein. For this reason a number of protein-positive samples was treated with 1.0 ml. trichloracetic acid (20 per cent solution), centrifuged, and a sample of the supernatant liquid tested with the glyoxylic acid in the usual manner.

In a further range of experiments peracetic acid was added to samples of urine which were known to give a positive glyoxylic acid test; this test was then carried out with urine samples thus pretreated. The specimens were allowed to stand for 30 minutes after the addition of the peracetic acid before glyoxylic acid and sulphuric acid were added.

Results

Out of the 65 urines from schizophrenic patients, 51 gave positive glyoxylic acid test reactions, six were doubtful and eight were negative.

Out of 55 non-schizophrenic patients, 40 gave negative urine tests, seven were doubtful and eight gave positive reactions. The positive results were not indicative of any group of non-schizophrenic psychotic disorder. They consisted of the following: mental deficiency, 1;

personality disorder, 1; dementia, 1; hypochondria, 1; paretic neurosyphilis, 1; epilepsy, 3.

The 12 control tests with urines of healthy adults gave negative glyoxylic acid test results. The tests were repeated—some up to five times—with urines of 41 patients of both schizophrenic and non-schizophrenic groups. Nine of these urines gave reactions which conflicted with earlier findings. Many urines which were negative for protein in the sulphosalicylic acid test gave positive color reactions in the glyoxylic acid test.

The removal of the proteins from the urines by the trichloracetic acid did not affect the results of the glyoxylic acid test. Urines, which reacted positively before, continued to do so after deproteinizing them. Urines pretreated with peracetic acid gave invariably negative glyoxylic acid tests, even where the tests had been positive before the treatment.

The clarity of the glyoxylic acid color reaction was affected in some urines, and it was found that some of these specimens came from patients who were on chlorpromazine hydrochloride (Largactil) treatment. Such results were classified as doubtful unless the colors characteristic of the positive reaction were clearly discernible.

The urines of patients on paraldehyde treatment gave in the glyoxylic acid test a brown ring at the junction of the reagents which wholly or partly covered up the true colors of the test. Unless a clear violet-pink ring was visible, such cases were classified as doubtful. Barbiturates did not interfere with the color development of the glyoxylic acid test. Constipation does not appear to affect the outcome of the test.

Discussion

The outstanding feature of the glyoxylic acid test with urines of psychotic patients is the great number of positive results given by urines of the "schizophrenic" group. In the majority of cases (78 per cent) urines of patients diagnosed as "schizophrenia" gave positive color reactions, while the majority of non-schizophrenic patients (74 per cent) gave negative urine tests. The positive color reaction, characterized by the appearance of the violet-pink color, is probably due to the presence of tryptophan and/or a related compound (6), which is condensed by the aldehyde and subsequently oxidized. Pure tryptophan gives a positive reaction only in the presence of iron or copper ions, while indole does not react positively. Indole in aqueous solutions, and if added to urine, gives a pink color to the reaction, and the violet color which is characteristic of the tryptophan group is completely absent.

The tryptophan group, resulting from the protein hydrolysis, reacts positively even in the absence of metallic ions (5). In the urines examined the positive glyoxylic acid reaction therefore may be due to either an indole derivative, obtained in protein hydrolysis, or to tryptophan, in conjunction with iron or copper ions, which are known to occur in small quantities in urine. The presence of protein in the urine is thus not needed for a positive reaction.

Prior treatment of urine with peracetic acid prevents the development of a positive color reaction. The cause of this cannot be accounted for with certainty as long as the substance giving the positive reaction in urines has not been identified. Although the work of Hopkins leaves little doubt that a positive reaction is given by the tryptophan group, it is possible that this amino acid is not the only substance in urine which reacts positively. The peracetic acid test results, however, support the assumption that it is present. Peracetic acid may affect the chromogenic properties of the indole nucleus of the tryptophan group by oxidizing the side chain of the indole ring. The acid is as specific in its reactions with amino acids as is performic acid (1, 2). It does not oxidize the amino group but reacts with another part of the molecule, e.g., with the side-chain of tryptophan, and in this way affects only cystine, methionine and tryptophan (7). From among these three, tryptophan is the only one giving a positive glyoxylic acid test reaction under suitable conditions. Thus, if the reaction is due essentially to the indole ring compound, it can be expected that peracetic acid will prevent a positive reaction.

No explanation is offered for the variation of the results of the nine repeats.

In the absence of further evidence the inference as regards the presence of a compound with an indole nucleus, such as tryptophan and

its metabolites, is of necessity a tentative one. But the large number of positive glyoxylic acid test results with schizophrenic patients, and its very frequent absence in the non-schizophrenic group, appears to be diagnostically of sufficient importance to warrant the publication of these results at the present stage.

Summary

1. The glyoxylic acid test with urines of psychotic patients gave positive reactions with the majority of the 65 schizophrenics, negative reactions with the majority of the 67 non-schizophrenics, including 12 normal adults.

2. The factors responsible for the test reactions are briefly discussed and related to the presence in the urine of a substance with an indole nucleus, other than indole, possibly tryptophan or its metabolites.

Thanks are due to H. H. Fleischhacker, M.D., pathologist, for his encouragement, to him and F. C. Hadley, B.Sc., for the many helpful discussions during the course of the work.

Bibliography

1. Alexander, P., Hudson, R. F., and Fox, M.: *Biochem. J., 46:* 27, 1950.
2. Alexander, P., Carter and Earland: *J. Soc. Dye. Col., 67:* 23, 1951.
3. Bullock, F. N., Clancey, I., and Fleischhacker, H. H.: *J. Ment. Sc., 97:* 197, 1951.
4. Fleischhacker, H. H.: Paper read at the meeting of the R.M.P.A. (Clinical and Research Section), February 11, 1953.
5. Hawk, P. B., Oser, B. L., and Summerson, W. H.: *Practical Physiological Chemistry,* 1949. London, J. & A. Churchill, Ltd.
6. Hopkins, F. C., and Cole, S. W. *Proc. Roy. Soc., 68:* 21, 1901.
7. Toennies, G., and Hoemiller, R. P.: *J. Am. Chem. Soc., 64:* 3054, 1942.

Biochemistry Department
Shenley Hospital
Shenley, Herts., England

THREE CASES OF SELF-CASTRATION[1]

SIDNEY E. CLEVELAND, PH.D.[2]

Self-castration among psychiatric patients who are oriented, rational and non-delusional is rare in Western culture. Presumably the pain, anxiety and general aura of disgust generated by this act would preclude such behavior in individuals in a fully conscious and rational state. Berlin and Gruenberg (1) have pointed out that genital self-mutilation among regressed, severely disturbed psychotic patients is not uncommon. Lewis (3) has described in detail many cases of self-castration in a schizophrenic population. The anthropologist Spencer (4) also has referred to the fact that in certain primitive societies genital mutilation is widely practiced. However, in the case of overtly psychotic patients or native tribesmen during exciting rituals, normal ego functioning is severely altered. This paper is devoted to the question of how such repugnant behavior can take place in the case of individuals who are conscious and apparently rational. Esman (2) offers some explanations in his report of self-castration in a patient not demonstrably psychotic at the time of the act, although apparently in an acute alcoholic state. Esman concluded that this grave and final act represented an impulsive, isolated piece of behavior but one with unconscious motivations understandable in the light of the clinical history. Essentially Esman found that his patient sought a primitive, basically infantile relationship with a mother figure. Self-castration removed the threat that genital sexuality would disrupt such a relationship. The act also brought closer to reality the patient's plea that he be treated like a little girl or preferably a child.

In the present paper three cases of successful or attempted self-castration are reported. Certain similarities with Esman's case in personality dynamics and motivation of the incident are apparent. However, an attempt will also be made to demonstrate that this supposedly impulsive and unpremeditated behavior is, in fact, replete with precedent and forewarning. At the time of their hospital treatment for the castration act these cases were not regarded as being overtly psychotic as they showed little of the overt behavior usually indicative of a frank psychosis. It is probable that in all three cases a chronic, covert psychotic process was operating. The distinction is important since in these cases the act of castration appears as deliberate and purposeful behavior, not the random self-mutilation of a frenzied patient.

The first case is that of a 29-year-old white male. He was an only child whose father died when the patient was three years of age. His mother remarried, but when the patient was eight years old, she was committed to a state hospital where she has remained. Until the age of 12 he was placed in an orphanage and was subject to harsh and cruel treatment. Especially noteworthy is his report that the girls in this institution were given much better treatment, and he recalls his envy of them and his longing to be a girl. At this same period he recalls injuring his scrotum accidentally while in rough play with other boys and states he felt even at that early age "he would be better off without such a painful appendage." Also, while at this orphanage he reports that the matron threatened bed-wetters with castration.

The next five years were spent in the homes of various relatives with whom he did not feel comfortable or wanted. Leaving high school at the end of his junior year he entered the CCC and later the Merchant Marine. One year's service in the Navy during World War II was followed by continued duty in the Merchant Marine where he advanced to the rate of Assistant Engineer. He was married and divorced twice and had two children by his first wife. At the time of his divorce from his first wife, he made his initial attempt at

[1] I am indebted to Drs. Isham Kimbell and Walker Thompson, Psychiatrists, Veterans Administration Hospital, Houston, Texas, for their description of the medical and psychiatric aspects of these cases. I am grateful to Harlan Crank, M.D., Psychiatrist, Houston, Texas, for his review of the paper.

[2] Clinical Psychologist, Veterans Administration Hospital, Houston, Texas.

castration but found the pain unbearable and sought medical aid after making a small incision in his scrotum.

Two years later, and four years prior to his final castration, he again attempted castration, and this time succeeded in making a serious incision of his scrotum requiring hospitalization. He became sterile as a result of this attempt. Also at this time he entered into psychotherapy. His therapist was a female psychiatrist, and he says of this experience, "She helped me a great deal but, of course, a woman could never really understand me." This second castration attempt coincided with depressive feelings following his failure to gain custody of his children. This event was of great importance since it served as a re-enactment of his own parental desertion. His final and successful attempt followed no specific event but stemmed from a culmination of feelings that if he were but to lose his disturbing sexual drive, all his problems would be solved. The final act itself was carefully planned, the patient constructing a metal clamp which he placed about the scrotum to control the bleeding. He excised the entire scrotum and contents and had indeed lost but little blood when he appeared at the hospital seeking medical aid. He performed this operation without the sedative aid of alcohol or drugs. In entering the hospital he was accompanied by a police officer, an ambulance having been called. The policeman was highly indignant and enraged at this patient. He expressed repeatedly his feeling that the patient should be severely punished for this act, including arrest and imprisonment. The patient's own reaction was one of bland unconcern.

The following "self-analysis" was written by the patient during his hospitalization. It reveals with amazing clarity some of his feelings and insights into his behavior.

"The case for Dependency Complex. 1. Desire for self-mutilation, i.e., penis and testes has always become strongest during periods of despondency and insecurity (emotional or financial). History of mutilation goes back to childhood, thoughts of castration and attempts all during periods of depression brought on by guardians and/or relationships with other children. Was never popular and was many times excluded from groups of children.

2. Choice of means of making a living: CCC, Merchant Marine, Navy. I have always been filled with apprehension when faced with need to compete on my own for a living. All these things I have worked at were jobs where my future was mapped out for me. I was literally a dependent.

3. Envy of girls: treated nicer and again depend on men to support them and supply their every need. In fondling young girls I was more interested in how they were constructed than in seducing or fondling them. Desired to be a girl, not operated on to change outward appearance of genitals as I realized that yours truly would not be anything that any man in his right mind would be attracted to. Homosexual? I think not: At least I have never been consciously attracted to any man sexually. Tried it only once. Didn't care for it and was ashamed and sickened at the memory of the deed. No, what I wanted to be was a moderately attractive girl. Impossible, of course. Probably due to an overwhelming need of affection I could depend on. Both my marriages were to girls who needed affection and someone to depend on. Evidently similarities repel and attract. Neither party found what they needed; result, grief. Two lonely people looking for something in the other that neither had. Our similarities were what brought us together and made us hate each other, both felt cheated."

Psychological tests revealed him to be of above average intelligence with highly intellectualized defenses. His Rorschach record was not severely distorted; however, recurring poor responses suggested some periodic difficulty in maintaining control. Fantasies having to do with bodily mutilation and distortion were prominent. For example, such unusual Rorschach responses as the following which seem to have direct reference to the castration act were given: "Somebody's scalp just been removed" followed at once by "a penis". On another card he saw "glands of the body, testicles" and followed this by "two weird female figures bent over holding something in their hands." His spontaneous drawing of a man was that of a naked man with penis and testes.

The second case is that of a 44-year-old white married male. He appeared in the hospital's emergency room with both penis and scrotum completely excised. He was in a state of alcoholic intoxication as well as shock from loss of blood. However, the following morning he was coherent, oriented and bland as to the entire occurrence. He disclaimed any part in the act and at first stated it had been done by his "wife's boy friend." Later he changed his statement and claimed thereafter that his wife had castrated him. However, it is apparent from his behavior prior to the event that he had practised self-castration. For

example, several days before the operation he had purchased a straight-edge razor which he had then hidden. His further declaration on being hospitalized stands as a masterpiece of understatement: "Whoever did this is sure in need of psychiatric help."

This patient is the older of two brothers. The younger brother is described in terms nearly the opposite of the patient: "Sociable, a leader, an athlete and industrious." The patient was born while the mother had pellegra. She is described as a complaining, highly nervous woman who, like the patient, became sick any time she exerted herself. The last five years of her life she suffered from a condition diagnosed as an involutional depression. In this state she openly cursed and rejected both her husband and the patient. The father took care of this woman and humored her neurotic demands but was unable to provide, on a small farm, even a marginal livelihood. The family was supported by welfare agencies from the early days of the economic depression to the present.

As a child the patient had severe nightmares and would awaken screaming. He complained of pain in the legs and groin at an early age. Phobias having to do with meeting people or associating in crowds were also reported. He completed the eighth grade of school and earned a partial living playing the violin in string bands. He was unable to continue on regular jobs more than a few weeks, quitting each time because of various pains and fatigue. Fourteen months military service was terminated by a medical discharge for anxiety neurosis. He married three times, the first marriage lasting but one month. A second marriage was to a woman 10 years his senior, and this marriage ended in divorce after one year. He has been married seven years to the third wife, and there are three children by this union. Since his discharge from military service in 1943, he has been hospitalized on 12 different occasions. Twice he was hospitalized for increased anxiety in connection with his wife's hospitalization for childbirth. Many of the hospitalizations were of brief duration for the purpose of clearing up acute alcoholic states. On one occasion he drank a pint of alcohol while on antabuse treatment. His behavior when drunk was described by his family and friends as dangerous, hostile and paranoid. When sober and hospitalized he was cooperative, meek and sought to please those in charge. One hospitalization in 1949 resulted in a right nephrectomy. Following the kidney operation he continued to experience pain in the genitals.

During one hospitalization in 1951, four years prior to the castration, he was given a battery of psychological tests. It is highly interesting that the psychological report at that time made specific reference to the possibility of self-castration. His Rorschach was judged to be a highly primitive, severely disorganized series of fantasies having to do with bodily mutilation and destruction. On the basis of these responses alone the psychologist raised the possibility that he was preoccupied with the idea of castration and that at the hands of a woman. Such highly unusual Rorschach fantasies as the following led to this prediction: "look like balls but they are hanging so low the only thing that holds them in are the spermatic chords." Following the castration he was again given psychological tests, and in general they remained unchanged. On both occasions his spontaneous figure drawing of a man was that of a naked man but without genitals.

The third case is that of a 31-year-old white male. He was admitted to the hospital following a serious but unsuccessful attempt to excise his own testicles. A severe cut in the scrotum requiring surgery to repair but without injury to the testicles was reported. Previously he had been admitted on several occasions for treatment of what was originally diagnosed as a severe anxiety state. During one of these periods he had become frankly psychotic, delusional and grandiose, saying that he had discovered the secret of life and of the universe. However, at the time of the attempted castration, he was coherent and logical, and no psychotic behavior was observed.

This patient had been married seven years and had four children. He is the youngest of four brothers and was given the name "Lois" by his mother. He states that she had hoped for a daughter to break the line of male offspring and had given him the name regardless. He also complained that she "treated him like an object, like a work horse, not a human."

The father was a farmer and was described as a placid and easy going individual. The patient completed the eighth grade, spent six months with the CCC, and at 17 years joined the Navy. Here he served well for five years and was discharged as a first-class petty officer. Four years prior to his attempted castration he was hospitalized with his genitals swollen and painful. These symptoms were judged at that time to be part of a generalized reaction to penicillin treatment.

Relations with his wife were especially stormy. Ordinarily he complained of being impotent, but when they had an argument and both became angry, intercourse could be consumated. Frequently prior to intercourse he would ask his wife to cut his penis and testicles. She reported that he had once remarked that he wanted them removed so he "could step on them and make them pop." Her refusal to cooperate with this request resulted in his own attempt. At one time he stated openly that his wife did not have enough love to expend on four children as well as himself. He clearly regarded them as his rivals in competing for her affections. Possibly he also reasoned that castration, in reducing him to childhood, improved his chances in this competitive struggle.

Psychological testing of this patient prior to both the psychotic episode and the attempted castration revealed a chaotic state of control with imminent danger of psychotic regression. It was felt that he relied heavily on superficial, highly intellectualized defenses. Suicidal tendencies were stressed, and his general orientation seemed to be one of disgust and pessimism. In his TAT stories, he assigned to men the role of weakness and unreliability. Women he saw unconsciously as much stronger and more reliant figures. He clearly longed for some kind of parasitic relationship with such a female figure. His spontaneous figure drawing of a man was that of a naked, asexual figure.

Discussion

Inspection of the histories of these three patients makes it readily apparent that the final act of self-castration was not an entirely unpremediated, irrational act. Rather, it is clear that considerable precedent had been established, and the event took place in a context of thinking that, to the patients, had some logic.

What are the assumptions these patients made, consciously or unconsciously, in deciding to carry out this behavior? In what context of life experiences does it occur? In the first place, all three cases had suffered injury of some sort to their genitals prior to the castration. Further, they seemed to have reacted to injury to the genitals with an unusual amount of pain and annoyance. For long periods of time, since childhood in two cases, "accidents", threats of punishment and illness had brought discomfort to their genitals. In the present cases, as with Esman's case, observers noted an absence of appropriate emotional reaction to the act. The patients appeared bland, unconcerned and resigned to the consequences of grave and irreparable behavior. We may speculate that this lack of response is related to the fact that psychologically the castration had occurred long before. In one case we note that the psychologist predicted the possibility of self-castration four years before the physical act. At least this long ago the patient in his fantasies had come to regard his genitals as something alien to him, something not acceptable within the boundaries of his own body image. In the second case cited the patient expressed on the psychological tests highly unusual fantasies having to do with the threat of loss of his genitals. This same preoccupation also appeared in the Rorschach fantasies of the first patient described. The two figure drawings done by the patients prior to the act are those of naked, but asexual, men. In other words, years prior to the biological castration these patients already conceived of themselves unconsciously as castrated, asexual individuals. The physical act may then serve but as the culmination of a lengthy psychological process of separation.

Parenthetically, it should be noted that the absence of such emotional expressions as remorse and grief following castration raises another interesting point. For one thing, other people are annoyed that a stronger emotional reaction does not occur. Real or imagined injury to the genitals, much less castration, is a highly charged, anxious experience in most people. If self-inflicted, the anxiety

in others seems multiplied. This is especially so since self-castration does arouse anxiety in those who have to deal with these eunuchs. The police officer accompanying one patient was beside himself with anger and indignation. Hospital personnel also reacted with variable degrees of anxiety, irritation and disgust, mainly by avoiding and, in subtle ways, neglecting these patients.

In other ways these patients as well as Esman's case had also indicated their dissatisfaction with their roles in life as adult men. Our first case stated the feeling most clearly, "I want to be a little girl, they are treated better (they lead a more passive, dependent existence)." All three men were married or had been married and had children. These children were regarded as serious competitors for the wife's affections. One patient openly expressed his concern that his wife did not have enough love to go around. Another patient, in a kind of "couvade", took to the hospital every time his wife delivered. This kind of behavior further illustrates the primitive, child-like level at which they function.

As far as could be learned, none of these men turned to overt homosexuality as a means of gaining this passive gratification. Two of the present patients and Esman's case did function with some success for a period of time in military and semi-military environments. It appears less likely they were attracted to these masculine institutions for whatever indirect homosexual gratification they offered than by the completely regimented, "literally dependent" atmosphere provided, as stated by the first patient. Even homosexual behavior requires a certain expenditure of effort and some maturity of interpersonal relations. These patients longed for the most primitive and basic kind of existence possible, without tensions of any kind. For the adult, the epitome of this kind of existence can be found only in death, and it should be noted that all three of the present cases were regarded as serious suicidal risks on the basis of both their clinical picture and their psychological tests. Through a kind of focal suicide these patients apparently hoped to shed some of their tensions and avoid adult responsibilities.

In these three cases and in Esman's case, a primitive, dependent relationship with mother seems to have been a primary motivating factor. The fathers of these patients are either absent physically from the home early in the patient's life or absent psychologically because of their ineffectual role. Although these patients longed for a dependent, child-like relationship with a mother-figure, it is also to women that they assigned the punitive, castrating role. In the present paper the second case quickly developed the delusion that his wife had castrated him. The third case repeatedly begged his wife to castrate him. All three cases in their psychological test material assign to women the punitive role. If one examines the kind of mothers these patients had, this attitude is understandable. The mother in the first case was schizophrenic, and subsequent substitute mothers were openly punitive. The second case described a mother who patterned her life on complaining, weakness and ineffectuality. In the last case the mother desired so strongly an obedient, subservient daughter that she gave her son a feminine name. Presumably she then proceeded to treat him in a manner befitting the name. Apparently a completely submissive, masochistic relationship is the only one tolerated by these women.

Conclusion

In summary, self-castration in rational and coherent adult males does not appear to be the highly unpredictable, unpremeditated and irrational act usually associated with this behavior. On the contrary, it culminates from a lengthy process, probably largely unconscious, by which the individual gradually dissociates psychologically these alien organs. These patients from childhood on associate pain, injury, discomfort and social penalties with their genitals. Such negative attitudes probably aid in the process of alienating these organs from the body image. It proved feasible to predict far in advance in one case the castration event on the basis of unusual fantasies appearing in the Rorschach Test. In all of the cases, highly unusual Rorschach fantasies having to do with mutilation of the body were found. In two of the cases these fantasies preceded the castration event. Needs of an extremely primitive and passive nature seem to predispose the individual for the act.

Castration serves to reduce them to the primitive, parasitic stage of functioning which they desire. The mothers of these patients appear to have insisted in various ways on a submissive, masochistic response from their sons. As expressed in their unconscious fantasies on psychological tests, all of these patients assign to women a punitive, castrating role. Fathers of these patients were either physically absent from the home or were absent psychologically because of their weak and ineffectual role. The act of self-castration arouses discernible anxiety in adult males who were associated with these patients. In one case this anxiety gave rise to a reaction of open indignation and anger; in more sophisticated individuals the anxiety was handled through avoidance of close contact with them or by overt neglect.

BIBLIOGRAPHY

1. Berlin, L. M., and Gruenberg, J.: Genital self-mutilation by mental patients. *J. Urol., 59:* 635, 1948.
2. Esman, A. H.: A case of self-castration. *J. Nerv. & Ment. Dis., 120:* 79, 1954.
3. Lewis, N. D. C.: The psychobiology of the castration reaction. *Psychoanal. Rev., 15:* 53, 124, 304, 1928.
4. Spencer, R. F.: The cultural aspects of eunuchism. *Ciba Symposia, 8:* 406, 1946.

RESERPINE[1] IN THE TREATMENT OF PATIENTS WITH CHRONIC MENTAL DISEASE

A Controlled Study

LAWRENCE KOLTONOW, M.D.

The chronically ill mental patient who requires close supervision but is still not badly deteriorated constitutes a growing problem in state mental institutions. In view of the many optimistic reports, the present study was undertaken to determine the value of oral reserpine in these patients. We began without a preconceived plan or goal.

The study was performed on a ward of patients requiring close supervision in view of histories of dangerous or potentially-dangerous acts. All were considered to be security risks, and only rarely was a patient moved to a more comfortable or a more deteriorated ward.

Of a total of 82 patients, 79.5 per cent had been hospitalized for from two to eight years; 22.5 per cent, over six years. Three-quarters had a diagnosis of schizophrenia, and two-thirds of these were paranoid type. Only a few were well enough to receive recreational therapy, and few were visited or taken out of the hospital for visits.

Procedure

Behavior during successive periods on varying doses of drug was carefully noted. The hospital pharmacist arbitrarily separated the patients into two groups, one of which received placebo tablets during the entire period of study. Although differences between drug and placebos soon became obvious due to drug effects, the attendants were not informed which was which. Medication was given each morning after breakfast, and the dosage altered for all patients simultaneously.

The patient's charts were all reviewed before the study was started. All the patients were interviewed before instituting treatment, frequently during treatment, and at the end of treatment. The impressions of the physician and attendant were noted at each interview. At the end of treatment, the daily ward and nurses reports were examined and evaluated as to recorded changes on the ward and on an individual basis. In general, the observations were twofold: one, specific patient behavior, and two, general ward behavior.

The dose was raised and lowered as follows: 2 mg. for 1½ weeks; 3 mg. for 2 weeks; 4 mg. for 5 weeks; 5 mg. for 6 weeks; 4 mg. for 1 week; 3 mg. for 1 week; 2 mg. for 1 week; 1 mg. for 5½ weeks. There were a few breaks in the consistent administration of the drug. A group of patients, which developed clinical Parkinsonism were placed on placebo, later were given the drug again. Also, two known epileptics were given reduced dosage. One patient of the 82 refused the medication for a short time. One patient became very disturbed and had to be transferred to a seclusion ward, removing him from the study.

Results

We observed somewhat the same sequence of responses that has been reported previously, that is, sedative stage, turbulent stage and stage of integration (1, 2).

At about the third to fourth week while on 3 mg. a day, the patients were noticed to be "more forceful" in expressing themselves. There were many challenges for fights, but fewer fights than normal.

At the seventh week, on 4 mg. a day, we had a period where the food consumption doubled on the ward. The patients gained weight very rapidly. There were more fights, but of less intensity. Near the eighth to ninth weeks, their weights generally started to revert to normal although the drug was not decreased.

At the ninth to tenth week, on 5 mg. a day, we first noticed clinical Parkinsonism in *five* patients, with typical mask-like fascies and cogwheel rigidity. The medications for these men were changed to placebo, and all their symptoms soon disappeared. Later, more men showed the same symptoms, but they were

[1] Reserpine (Serpasil) furnished by CIBA Pharmaceutical Products Inc., Summit, New Jersey.

continued on the drug. As the dosage was lowered, their symptoms also disappeared. The original five men were again placed on reserpine after their Parkinsonism disappeared, and again they developed the same symptoms. However, as the drug dose was lowered and eventually stopped, their symptoms also disappeared.

About the eleventh or twelfth week, still on 5 mg. a day, we were especially aware of increasing sociability on the patient's part. The patients who had not talked with the ward doctor or attendant in years would engage in conversation. Fights now decreased in number. After 5 weeks on 5 mg., we began decreasing the dosage rather rapidly. The ward became more restless and noisy. Some patients who were improved seemed not to be affected by the decrease in dosage, some required maintenance of 1 to 3 mg. a day to prevent regression.

After five and a half months, the experiment was stopped completely. There were signs that the ward would revert to pre-control behavior. The most improved men were moved off and given jobs. Some patients who showed signs of improvement, as noted above, were restarted on the medication.

The general feeling was that the drug made the ward quieter and the patients much easier to handle.

Patients were divided into three major groups: improved, no change, or worse. The improved were qualified as Grade I, II, and III. Grade I improvement meant that the patient showed only minimal improvement such as being less combative or resistive or quieter. Grade III meant that the patients were well enough to be given a job and possibly transferred from the ward. Grade II was somewhat in between, that is, they showed marked improvement but were not well enough to hold a job.

Of the 41 patients who received reserpine, 24 showed improvement (58%), 16 showed no change, 1 was worse. Of the 24 showing improvement, 11 of these showed Grade I, 6 showed Grade II, 7 showed Grade III. Of those on placebo, 2 showed improvement, 35 showed no change, and 2 were worse. Of the 2 showing improvement, one was Grade I, one was Grade III.

A breakdown into diagnoses showed that of the 32 schizophrenics receiving reserpine, 19 showed some improvement. Eight of these were Grade I, 6 were Grade II, and 5 were Grade III. A majority of the schizophrenics were paranoid type. A breakdown into types of schizophrenia and improvement showed that 50 per cent of the paranoid schizophrenics were improved. Three out of three (100%) catatonics were improved, 4 out of 4 (100%) simple schizophrenics were improved, and 3 out of 4 (75%) hebephrenics were improved. Five of the patients on the drug were diagnosed as mentally deficient with psychosis. Three of these showed improvement.

One of the remarkable differences noted was that of weight change during therapy. The patients gained weight, some very rapidly, while the dosage was increased and later lost weight with continuation of drug. The average weight gain of those on reserpine was 10.6 pounds as contrasted to 3.2 pounds for those on placebo.

The average age of those showing improvement was 38.4 years; the remaining patients average 47.8 years.

Side Effects

The most pronounced side effects were flushing, agitation, stiffness of legs, swelling of the face, aching of the legs and tremor. Of those on reserpine, 27 per cent complained of walking difficulty due to stiffness of the leg while 14 per cent complained of aching of the legs. It might be speculated that these were premonitory symptoms of clinical Parkinsonism. All the side effects disappeared when the drug was stopped or markedly decreased.

Interpretation

We feel that the results showed that in a group of mentally ill patients who require constant close supervision, reserpine produced significant behavioral improvement as contrasted to placebo. Of the 41 patients on the drug, 58 per cent improved; 17 per cent improved enough to be able to be transferred off the ward and given responsible work assignment. In view of the above statistics we might speculate as to areas where the drug would be of value. First is that the ward would be easier to supervise and therefore produce more

efficient attendant care. Secondly, patients who otherwise seem to show no hope might respond enough to work or even be discharged from the hospital.

The gain in weight, we believe, is significant and might be a prognostic aid in evaluating the effect of reserpine.

We would like to comment on what can be called a "therapeutic paradox". When we asked the attendant to evaluate the progress of the patient, he often stated the patient was worse. When asked why, it was reported that the patient became disobedient, more restless, more talkative, and more of a nuisance. From the attendant standpoint, the patient was worse. However, we saw, as the study continued, that these were the first signs of improvement. It was as if the shell of schizophrenic autism and withdrawal was being weakened and the patient was re-entering the world of reality. He no longer would sit quietly in a chair most of the day, but would reach out for more human contacts. This often led to fights as we noted in the study. For example, one patient paced back and forth almost continuously and, for a time, was difficult to control on the ward. Later he was improved enough to be transferred to a very comfortable ward and is now holding a job. The first signs of improvement and therapeutic effect often make ward management and attendant work more demanding.

Certainly, the attendants should be oriented as to this phase so that they will not be disturbed. During our study, it became evident that the success or failure depended to a good measure on the complete cooperation of the attendants.

Summary

The results of a five and a half month control study on the use of oral reserpine in a close supervision ward show the drug to be definitely pharmacologically active and effective in influencing patient behavior. Ward behavior was quieter and more easily managed. Some patients improved enough to be transferred to more comfortable wards and were given work assignments. In view of the above findings, the possibility of routine administration to all chronically ill patients could be considered.

BIBLIOGRAPHY

1. Noce, R. H., William D. B., and Rapaport, W.: Reserpine (Serpasil) in the management of mentally ill. *J. A. M. A.*, *158:* 11–15, 1955.
2. Kline, N. S., and Barsa, J. A.: Treatment of 200 disturbed psychotics with reserpine. *J. A. M. A.*, *158:* 110–111, 1955.

Pontiac State Hospital
Pontiac, Michigan

INDIVIDUAL REACTIONS OF ALCOHOLIC AND NEUROTIC PATIENTS TO MUSIC

A. ZANKER, M.D. AND M. M. GLATT, M.D.

In a previous paper the authors (13) reported an experimental study on the influence of music on two groups of patients, alcoholics and neurotics, in a public mental hospital and described the reactions of these patients as groups and in general. In addition an attempt has been made to analyze the responses of these patients also individually with the help of two lists of statements and responsive words (drawn up chiefly by our psychologist, Mrs. C. Bathurst).

With the object of investigating the effects of music on groups of people questionnaires have been devised and used in the past by several authors. Referring to the investigations by Hevner (4), Mitchell (6) pointed out that the large list of adjectives used by Hevner "might create confusion in healthy minds to say nothing of the mentally disordered", but nevertheless he advocated the use of questionnaires "particularly if combined with studies of individual personalities" stressing the fact that "the latter aspect has been neglected." The recitals described in our previous paper (13) provided an opportunity to follow up Mitchell's suggestion.

However, there is a variety of factors which seem to play a part in the reaction to music shown by patients in a mental hospital. Of these factors three seem to be of particular importance.

1. The length of stay of a patient in the hospital at the time of the recital: for example, a non-accepting, suspicious, negative attitude of a patient towards the hospital may also be displayed in a negative reaction to music recitals offered by the hospital. This was shown in the case of several patients whose general negativistic attitude was reflected in a negativistic, even hostile reaction towards the music recitals at an early stage of their hospital stay (although it is interesting to note that this attitude did not reveal itself in an open "boycott" of the recitals but merely in the "negative" reaction). After a somewhat longer hospital stay these patients gradually came to accept the hospital and its doctors, and this changed attitude was also mirrored in a more "positive" response to the music recitals.

2. It was frequently observed that mood swings of individual patients were accompanied by corresponding alterations of their attitude to the recitals: for example, an "incongruous", unexpected response often appears to be evoked by the disturbed phase through which this patient was going at the time of the recital.

3. Important too is the factor of the individual's personal associations connected with a special musical item, naturally varying from individual to individual.

4. The factor of the artist's personality and of the performing artist's like or dislike by the individual patient always has to be taken into consideration. The ability of the artist to make warm human contacts—discussed in our previous paper (13)—has to be stressed again in this connection.

5. Wherever there is any contact between two people, but more especially so in the relationship between doctor and patient, a suggestive factor must enter into the picture. Thus in every form of treatment, suggestion plays a part, and, as far as music therapy is concerned, here too a more or less good rapport between the group and the doctor and the attitude of the doctor to music therapy is bound to have repercussions showing themselves in the nature of the responses.

The first of the two "questionnaires" (a term used in a very loose sense only when describing our lists of statements and words) consists of a list of 45 statements about music, and patients are asked to tick off those statements that express their own sentiments. This procedure aims at showing patients' reactions regarding the positive (particularly the socializing) effects of music on a group. The second "questionnaire" presents a list of words, each describing a particular mood or feeling, and patients are asked—after each musical piece played—to tick off the words describing the mood or feelings aroused in them. In the second

"questionnaire" we were particularly interested in observing whether the responses of the individual patients were congruous with the intrinsic character of the musical item in question, or otherwise. While there can be divided opinions as to what constitutes a congruous and what an incongruous response to a musical item, there is on the whole little doubt as to the expected response to a harmonious, uplifting, joyful item or to a clearly sorrowful, disharmonious piece of music. Few would disagree, for example, if one were to call a response, describing Bach's "Sheep May Safely Graze" as "distortion" and "bleakness", a clearly incongruous, unexpected reaction. The response of another patient to the same item as shown by his ticking off "harmony" and "joy" appears to be a clearly congruous response, being in full accordance with the character of this particular piece.

I. First "Questionnaire" (List of Statements)

Theoretically a patient's responses and reactions to a musical item could be determined chiefly by one of two main factors. As pointed out above, the response could be expected to correspond to the intrinsic character of the musical piece, but, on the other hand, one might also perhaps expect that these reactions might be modified by this particular patient's mood at the moment or by his general attitude, temperament, etc. Bearing the latter aspect in mind when studying the responses ticked off in the first questionnaire, one of the authors—who had a more intimate knowledge of the personalities of the patients concerned—was asked by the other author—who later analyzed the responses—what kind of response he would have expected from each individual patient, and it was surprising that with few exceptions the guesses were confirmed by the actual results: i.e., responses often turned out to fall in line with the individual patient's general attitudes and personality.

As stated above the majority of individual patient's responses to the first questionnaire were in accordance with what was to be expected from a knowledge of the patient's personality. To illustrate this point four cases will be described very briefly:

Case A: An aggressive alcoholic psychopath who had no interest in music and in hardly any other subject. The statements ticked off were almost exclusively the "negative" ones; e.g., "listening to music often makes me stormy, violent, uncontrolled, and angry with my fellow men", or "music revives memories of fallen hopes and lost ideals and makes me feel that life is too hard", or "when listening to music in a group I find that other people's attitudes seem to interfere with mine and that makes me irritable."

Case B: A patient in a gross paranoid tension state which later necessitated leucotomy. It was not really surprising that although he was to a certain degree interested in music, he reacted negatively to the recitals to an excessive degree, as at that time he was in a very resentful and tense state. Significant of his paranoid attitude was the fact that he spontaneously added a concluding remark in his own writing: "the stay at the hospital has taught me to hate all music. I am compelled to listen to music 24 hours a day." (He hated radio and television.)

Case C: In this patient a positive response was noticed when musical items were played where such pronounced positive responses could not be expected. Both the total number of positive responses and the overenthusiastic quality of the whole picture appeared to be "too good to be true". This patient was a typical psychopath of the "impostor" type, well known for his skill in displaying a deceiving facade of "goodness".

Case D: An alcoholic, inadequate psychopath lacking in any constructive interests was not expected to evince any interest in music recitals. His responses were characteristic, in so far as among a possible total of 45 responses he ticked off no more than 11 sentences which were all "negative" without a single exception. Thus he chose sentences like "I think merely listening to music is too passive an experience to have any social value", or "I don't think listening to music has much affected me one way or the other", or "listening to music lulls one into inactivity, evil as well as good" and "... may urge people on to anti-social acts."

II. Second "Questionnaire" (List of Words)

The responses to the second questionnaire were on the whole much more revealing than those to the first as will be evident from the few following illustrations.

Two female patients were very interested and well educated in music, one of them once having been a pianist of promise. From both, one could have expected "congruous" responses as there was little doubt that they were familiar with most of the musical items and had a full understanding of their intrinsic character. It might therefore, on the first

glance, be considered surprising that one of these two patients (Case E) described Mozart's song, "Now Your Days of Philandering Are Over", as "bleak" and Haendel's, "Wherever You Walk", as "restless". The probable explanation for this response—which one would have to term "incongruous" considering only the intrinsic character of the piece—is that this patient in her present very tense and emotional state could not tolerate the harmonious mood contrasting so much with her own doubt-ridden, restless and anxious state of mind. This seems to support the hypothesis —to be enlarged on later—that patients often reflect in their responses their own mood, in this case the response which was expected to be a "congruous" one in view of her musical education and interest was changed completely due to her state of mind at the time.

The second of these two patients with musical education (Case F) showed similarly surprising, "incongruous" responses; descriptions such as "restless", "sorrow", "yearning", being in the majority although not justified by the nature of the musical items described. The fact that "yearning" was ticked off three times in one musical session reflected obviously this patient's own mood of unfulfilled desires. She was a middle-aged alcoholic with marked neurotic features; she was preoccupied with the insecure state of her marriage; her husband had left her three years ago, but she was still anxiously hoping and yearning for his return.

An incongruity in the opposite direction is illustrated in the case of the alcoholic psychopath mentioned above (Case C) who showed an excessive number of "positive" responses, some of them quite incongruous with the intrinsic nature of the musical item. Altogether he wrote down 32 responses to the musical items played, 24 of them were in the nature of "contentment", "gleefulness", "harmonious", "joy", "uplifted". It is possible that at that time he was in an optimistic mood, having by then accepted the hospital and its staff. But in view of his general inconsistency and unreliability it is not surprising that he broke down again shortly after leaving the hospital.

A similar "over optimistic" response with mainly cheerful, positive responses was also shown by another alcoholic patient, an aggressive psychopath (Case G). This response was completely in accordance with his overconfident, overbearing personality. He was a very active and forceful man but was lacking in persistence; his career showed frequent ups and downs; often he worked his way well up into good posts but never was able to hold on to them for very long. In his responses there was an over emphasis on "adventurousness", "restlessness" and "strangeness". It was clear that these responses mainly reflected his own attitude towards life: that of a very restless, adventurous Don Juan type. One of his more surprising responses was his description of his reaction to Grieg's "Wedding March" as "savage". However, his behavior in the past on occasions could not be described by a better adjective than savage, brutally assaulting even near relatives, especially when his conscious inhibitions had been diluted by the excessive intake of alcohol. In his case it might perhaps be worth while to speculate on the change noticed in his responses to later recitals. They gradually became more "congruous" and coincided with a marked and very noticeable change of his general attitude while in the hospital. He came to accept the fact that he was an alcoholic; he began to see and to consider other people's points of view; and gradually his life turned from a depressed towards a more hopeful stage, with his wife who had left him returning to him. His more positive attitude to the music recitals was just one aspect of his increasing acceptance of the hospital "teaching" in general, and it is interesting to note that this patient's change into a more integrated personality has persisted now for $1\frac{1}{2}$ years after leaving the hospital.

A much more drastic and perhaps still more significant response could be seen in the case of the obsessional neurotic with marked depressive and paranoid features, mentioned before (Case B). Two questionnaires filled in by him prior to his leucotomy were extremely "negative" and "incongruous". Thus Arne, Haydn and Quilter made him "restless" and were ticked off as "bleak", "mechanical" (including here even folksongs like Cecil Sharpe's "O, No John"). What perhaps is even more significant of his state at that time was

the fact that he spontaneously added in his own handwriting three responses "nil" (a response for which no provision had been made in the printed list). He thus demonstrated the very hostile, antagonistic phase through which he was going then, which ultimately necessitated leucotomy. (He was then so tense and desperate that he himself for some time urged this operation.) In later lists—sometime after his operation which led to a marked subjective and objective improvement clinically—his reaction appeared much less disturbed though he still ticked off the Dvorak sonatina and Czech dances as "restless", and again he spontaneously added in his handwriting the word "nil" but this time only for one musical item. That this item, the Hungarian Dances by Brahms-Joachim, played with much temperament by a Czech violinist—should have left him completely cold seems suspicious, and might perhaps have constituted a defense reaction against his pronounced aggressive and sexual tendencies.

A surprisingly negative and excessively incongruous response was shown by an alcoholic psychopath prone to gross mood swings (Case H). He was known as a very self-centered and self-indulgent personality who had spent most of the last five years in prison (and who has again been sentenced to imprisonment since leaving the hospital). This patient's reactions to Arne's "When Daisies Pied", to Haydn's "She Never Told of Her Love" were "bleak" and "austere". Quilter's "When Icicles Hang by the Wall" aroused in him the mood of "distortion", and nearly every item was ticked off as "strangeness". In contrast to the above-named psychopathic patient (Case G) who did well after leaving hospital, this patient's reactions reflected no improvement in his later questionnaires, and his antisocial tendencies may have been more fixed and rooted more deeply.

Interesting from another point of view was the reaction of a neurotic male patient (Case I) who was known as an emotionally deprived, affectionless, suspicious personality who believed "the whole world" was against him and always complained that he did not get a fair deal. His restless, suspicious nature and feelings of having been "deprived" are well reflected in his responses among which "sorrow", "restlessness" and "yearning" were prevailing in number. Particularly "incongruous" seemed to be his ticking off "sorrow" as his reaction to Arne's "When Daisies Pied", "strangeness" to Haydn's "She Never Told of Her Love", and "restless" to some items by Mozart and Haendel.

In another patient, an inadequate alcoholic (Case J), responses at one period appeared fairly "congruous" but became very "incongruous" and "negative" at a later phase, which was surprising in view of the fact that he was a music loving person. Inquiries then revealed that preceding the latter phase his girl friend had left, so that his "incongruous", "negative" reactions reflected his emotional disturbance at that time.

A response showing complete indifference was shown by a schizoid personality (Case K) who ticked off two responses only and added spontaneously in large letters at the end of the printed list "no mood or feeling aroused". This particular recital (Dvorak, Granados, Czech, Hungarian and Spanish dances) contained very strongly rhythmical and stimulating items: that this patient should show no mood or feeling reaction is of course a response quite "incongruous" with the intrinsic character of the music but can be easily understood in the light of his schizoid apathy and shallowness of his emotions.

Interesting because of the number of contradictory and "incongruous" responses was Case J, a neurotic patient who had been an opera singer. Thus he ticked off the same musical item with "harmonious" and "restless", another piece with "contentment" and "restless". He had asked to be allowed to attend these recitals although he was not a member of the groups for whom they were performed, and obviously his attitude towards music was a very positive one: in his responses he often overdid in cheerful adjectives, thereby also manifesting his generally extraverted nature. Yet he could not escape revealing his neurotic conflicts by the contradictory nature of his responses; he was an anxious, unstable and very hypochondriacal individual.

A similarly revealing reaction may perhaps be also seen in the quite "incongruous" response given by a female, unstable, alcoholic psychopath. She only gave descriptions such as

"distortion" (and this to Mendelsohn's "Spring Song"), "strangeness", "sorrow", "restless" in a program of Bach, Mendelsohn, Grieg, Liszt and Chopin. Obviously music could not influence her in her very negativistic, disturbed mood at the time although the performing artists had very warm, outgoing personalities. This patient had previously been an actress; did she perhaps envy the artists their success, or did she perhaps because of unpleasant personal associations or feelings of her own professional failure reveal in her negative responses her envy of their charm? (Case K).

Case L concerns a psychopathic alcoholic and drug addict who in addition to his highly "incongruous" and negative responses spontaneously added some rather hostile descriptions, such as "discomfort" and "harshness" as if he were not satisfied with the offered range of negative mood descriptions. A clinical note in his case paper described his general attitude at the time as "paranoid, hostile, aggressive, overcritical and intolerant", and obviously his general negativistic attitude also showed up in his reaction to the music recitals.

Discussion

When comparing the reactions of the members of the neurotic group with those of the alcoholic group (which comprised in general older people with a better cultural, social and occupational background but also included a certain number of psychopathic personalities (13), there was on the whole more "incongruity" in the responses of the neurotic group. However, our tentative observations about the frequency of "incongruous" responses in both these groups show a marked difference from observations on "normal" people: thus the investigations on the effects of music on moods by Schoen (11) and Gatewood (a study of more than 20,000 mood change charts, after playing of vocal and instrumental music recordings) showed that in general not only does a musical composition produce a change in the listener's affective state but also that its effect upon a large majority is strikingly uniform. A second investigation to test the consistency of musical effect (as reported by the listener) showed a surprisingly large consistency on the second hearing of a selection (12). Our present investigation failed to show such uniformity of reactions. Nor does it support Altschuler's now widely held views on the "iso-principle" (1) regarding the advisability of playing music identical with the patient's mood. From the frequent occurrence of "incongruous" responses with unpleasant feeling tone in the present study it appears that patients sometimes project their own unpleasant or sad mood into musical items even if these have got an intrinsically pleasant and gay character—perhaps following an unconscious urge for such projection and thus gaining some relief from their own "unpleasant" feelings. Likewise patients in a very cheerful, optimistic, adventurous frame of mind often read much gaiety and adventure into musical items which are essentially of a calm and very controlled nature.

Some of our findings seem to be more in agreement with the rather critical views expressed by Soibelman (12), "It has been stated that music does not always convey to the listener the mood intended by the composer even when the listener is another musician. . . . Mood effects are often judged by subjective reports based on predetermined word lists made to conform to the emotions that the music is supposed to evoke. Introspection thus plays a large part in some of the experiments, and while valuable general information may be obtained in this manner, the verbal responses are likely to be coloured by association and the method is statistically unreliable." While some findings in the present study support such views, it yet appears that patients' reactions to the "questionnaires" presented to them in the present study have not been without some diagnostic and therapeutic value.

In view of the great number of incongruous responses to the second "questionnaire" (i.e., list of words to be ticked off) and of the findings on analysis of individual incongruous responses, the general assumption that there are specific music-influences (an assumption sometimes leading as far as to prescribe a certain type of music for certain conditions [Paperte, cited by Podolsky (8)], as e.g., the presentation of a certain musical program against jealousy [Pfeifer, cited by Podolsky (8)]) has to be challenged. Gay items are not

necessarily reacted to by feelings of gaiety, sad items not necessarily by sadness. In the present investigation an intrinsically gay and harmonious item sometimes aroused feelings of sorrow and "distortion", perhaps because that individual, when feeling miserable and deeply disturbed at that period, was unable to accept the contrasting moods of joy and harmony presented to him by the music. Being unable to bridge this gap between their own disturbed frame of mind and the gay character of the music, these patients often read "themselves" into the music played or sung; their own mood is projected irrespective of the intrinsic character of the music presented to them.

Thus the problem as to whether classical, harmonious music is best for one type of mental illness and romantic or modern music for another type, whether calm, soothing music should always be chosen for uninhibited, excited patients and "stimulating", even sensual music for the inhibited, withdrawn ones, would require some revision in the light of the present study. Mitchell (6) quoted an experience when calm, classical music played to refractory patients led to general fighting among them.

On the first glance some of the findings presented in this study seem partly to contradict some conclusions reached by previous papers describing music therapy at this hospital (7) as well as by other observers regarding the specificity of musical influences. One can only speculate as to the factors responsible for the differences observed. It is important to remember in this connection that the present study was deliberately carried out as a research object; patients were told before the recitals that they should mark lists without any preconceived notions, and the attending doctors gave no indication as to their own reactions or as to the responses they expected. On the other hand, if music "therapy" is carried out by doctors interested and believing in its value, then as in any other therapeutic relationship between doctor and patients, an enthusiastic attitude of the doctor will probably by itself lead to a more "positive" and more "congruous" response by his patients. Of equal importance in considering the difference in responses in the present when compared to other studies is the fact that we chose these groups and their members independently of whether they were interested in music or not, while e.g., Mitchell and Zanker (7) selected patients who were interested in music. Another difference between the patients observed in the present study and other types of mental patients is that these neurotics and alcoholics were well able to verbalize their feelings, while with psychotic patients the therapist naturally has to try to assess reactions by other means which is of course much more difficult and accompanied by the risk of misinterpretation on the observer's part.

While thus the observations based on the use of the lists of words and responsive statements and presented here to some extent seem to invalidate the views on specificity of musical influences, at the same time they appear to bear out the claim that the study of the reactions of mental patients to music can throw some light upon their unconscious attitudes and conflicts and thus constitute an additional help towards gaining a better insight in patients' problems and personalities. Thus "music therapy"—an expression sometimes perhaps used in a somewhat exaggerated way —may often be a helpful adjunct to individual and group therapy, and diagnostically improvement will often reveal itself in the reactions to these musical recitals, for example, in the lessening of incongruity of responses shown in the analysis of the "questionnaire". There is, however, no need to be disappointed about the frequently observed projection of patients' emotional conflicts and moods into music instead of allowing music to use its own intrinsic influence, as this unconscious mechanism may often be a way of achieving some measure of relief, a fact emphasized by Fultz (2). Also an analysis of the previously emphasized personal associations attached to a particular musical item could also be used therapeutically.

It remains an open question whether patients' responses could be made to become more "congruous" by a longer period of "systematic" music therapy, and whether this increasing "congruity" would often reflect (or perhaps even assist towards) greater personality integration. One would only be

entitled—strictly speaking—to speak of a therapeutic influence of music as expressed in patients' responses to musical recitals when other therapeutic activities going on in the hospital have failed to alter the patients' personality favorably, and then under the influence of music a gradual reversal of the nature of the responses begins to set in: from at first mainly reflecting the patient's mood or state of mind towards becoming more congruous with the intrinsic character of the musical items. In practice it will prove exceedingly difficult to exclude other possibly important factors, as for example that of the general "atmosphere" of a mental hospital (9), which must exercise some therapeutic influence on patients. There also remains the difficulty of coming to a more objective agreement as to the "intrinsic" nature of a musical item and as to what constitutes a really "congruous", generally expected response.

A further difficulty in arriving at an objective judgment about patients' reactions to music is the "subjectivity" of responses, a point emphasized by Howes (5) who stresses the fact that all listeners to music listen to music in a for them characteristic way. He quotes Vernon Lea's classification of music listeners into Cecilians (susceptible to the sheer power of sound, sensuous euphony), Dionysiacs (who respond predominantly to emotion), and Apollonians (with the intellectual-technical approach). Therefore responses to questionnaires or lists such as used in the present study are bound to be colored by the "characteristic" way of listening to music of these different types of music listeners.

Conclusions

From previous and present studies on the influence of music upon mental patients it appears that three main mechanisms are involved in their reactions to music.

1. Unconscious levels are sometimes reached and conflicting material brought to the surface which was previously withheld in psychotherapy. This effect of the subverbal approach through the medium of music may be compared with the narcoanalytic method where conscious resistance is overcome with the help of a drug, repressed unconscious material allowed to come to the surface thus becoming more amenable to psychotherapy.

2. Abreaction, catharsis, patients "letting off steam" when struck by music at significant focal personality points. Here the breakthrough of repressed unconscious material leads to relief of emotional tension. This is of course not a specific effect brought about by "music therapy" which, however, may sometimes act as a short-cut in the breaking down of defenses.

3. Projection. According to Rosenzweig (10) in projective techniques in general ". . . the projective stimulus is supplied as it were by the individual himself rather than by something external . . . the role of such external stimuli being thus secondary to the meaning imposed by the subject in his responses." On the whole in psychiatric practice projection must be considered a therapeutically "negative" defense mechanism as it evades or disguises the issue. As far as patients' reactions to music are concerned, however, where listeners apparently often project their mood or general attitude into the item listened to, the mechanism of projection may have some "positive" therapeutic value: for example, if a usually indifferent patient reacts to the offered musical stimuli—even in an "incongruous" manner—he may do so prompted by an unconscious urge to relieve inner tension. This may be analogous to the effects of projective play techniques in young children "who are too young to achieve the verbal expression required" (10). As far as the diagnostic value is concerned, here too the mechanism of projection in mental patients as revealed in their reactions to music may be used as an important tool by the therapist; this again corresponds to Rosenzweig's view that the diagnostic value of projective techniques in children may become more widely recognized, in addition to their cathartic and therapeutic applications.

Finally we would agree with Gutheil's (3) more realistic views about "music therapy" which he considers still in its initial phase, and about the need for much more research. This would have to take in account all the previously mentioned difficulties. At the present stage it may seem more appropriate to speak with Gutheil of "music as adjunct to psy-

chotherapy" rather than to use the more ambitious term "music therapy".

We should like to express our thanks to the British Council for Music in Hospitals for making this study possible, and to Dr. T. P. Rees, Physician Superintendent of Warlingham Park Hospital, for his encouragement.

BIBLIOGRAPHY

1. Altschuler, I. M.: Four years' experience with music as a therapeutic agent at Eloise Hospital. *Am. J. Psychiat., 100:* 792–794, 1944.
2. Fultz, A. F.: Music as a modality of occupational therapy. *War Medicine, 5:* 139, 1944.
3. Gutheil, E. A.: Music as adjunct to psychotherapy. *Am. J. Psychotherap., 8:* 94–109, 1954.
4. Hevner, K.: Experimental studies of the elements of expression in music. *Am. J. Physiol., 48:* 246, 1936.
   Hevner, K.: The affective value of pitch and tempo in music. *Am. J. Psychol.*, 621, 1937.
5. Howes, F.: Music in medicine. Third Cantor Lecture. *Lancet, 1:* 597, 1955.
6. Mitchell, S. D.: Music and psychological medicine. *Proc. Roy. Musical Assoc.*, Session LXXVII, p. 29, 1951.
7. Mitchell, S. D., and Zanker, A.: The use of music in group therapy. *J. Ment. Sc., 94:* 745–747, 1948.
8. Podolsky, E.: Music and mental health. Ment. Health, *13:* 99–109, 1954.
9. Rees, T. P., and Glatt, M. M.: The organization of a mental hospital on the basis of group participation. *Internat. J. Group Psychotherap., 5:* 157–161, 1955.
10. Rosenzweig, S.: Projective techniques: Their progress in the application of psychodynamics. In *Orthopsychiatry 1923–1948.* Menasha, Wisconsin: George Banta Publishing Company, 1948, pp. 456–469.
11. Schoen, M., ed.: *The Effects of Music.* New York: Harcourt Brace, 1927, pp. 78–120.
12. Soibelman, D.: *Therapeutic and Industrial Uses of Music.* New York: Columbia University Press, 1948, p. 208.
13. Zanker, A., and Glatt, M. M.: The influence of music on groups of alcoholic and neurotic patients in a mental hospital. *J. Nerv. & Ment. Dis., 123:* 403–405, 1956.

WARLINGHAM PARK HOSPITAL
SURREY, ENGLAND

THE INFLUENCE OF MUSIC ON GROUPS OF ALCOHOLIC AND NEUROTIC PATIENTS IN A MENTAL HOSPITAL

A. ZANKER, M.D., AND M. M. GLATT, M.D.

In a previous investigation reported by Mitchell and Zanker in 1949 (3) dealing with the use of music in group therapy at Warlingham Park Hospital, a mixed group of neurotic and psychotic patients had been selected who were interested in music prior to their admission and who had a certain degree of musical education. A somewhat different type of investigation was undertaken here in 1954 with the support of the British Council for Music in Hospitals. Two sharply-defined groups of patients—members of the alcoholic and of the neurosis unit at W.P.H.—were chosen irrespective of whether they were interested in music or not. Musical recitals of one-half hour were carried out twice weekly with the object of finding out what would happen to the members of these groups if subjected to a concentrated musical influence.

As to the composition of the two groups investigated in the experiment under review, they both were mixed groups comprising 10 to 20 patients, staying at the hospital for a period of about two months. They were all at the hospital of their own free will. On the whole, the alcoholics were about 20 years older than the neurotics (40–50 years as against 20–30) and contained a certain proportion of psychopathic personalities; they were of higher average intelligence and better educated (1) than the neurotics. The latter lived in a block isolated from the rest of the hospital (2), and the recitals for the neurosis unit took place in a sitting room at that block. The alcoholics, on the other hand, lived in wards mixed with some other patients and attended recitals carried out in one of the wards. All recitals were carried out in a very informal atmosphere; attendance was voluntary (however, practically all members of both units attended the recitals); and at the end of the recital a discussion took place in which patients were encouraged to talk about their reactions and impressions and to offer suggestions and criticism. The discussion was chiefly carried out by patients and the visiting artists while the attending doctors kept in the background as much as possible.

I

1. Starting with the *Alcoholic Group* it was evident after the first recital that the group could be divided into two sections—those who had always been interested in music and who appreciated the more serious type of music (as played during the first recital), and those who preferred lighter music or showed no musical appreciation at all. Among members of the first section, group discussion and group cohesion were fostered, probably because of a common interest in music and a deeper capacity for appreciation. Introduction of several lighter musical items into the program during later recitals brought at least some parts of the program within "reach", understanding and appreciation of an additional number of patients, but there was necessarily a cleavage—as far as musical understanding was concerned—between the two sections of the alcoholic group. If in future experiments one wants to increase group cohesion and achieve a more lasting and deeper effect from music, the best course would be to select patients on the basis of a common interest in music and with a more equal level of musical understanding, and not—as it was done for the purpose of this experiment—on the basis of a common psychiatric diagnosis. Nevertheless apart from the definite entertainment and cultural value of these recitals, they appeared to be of some therapeutic influence in the great majority of the members of this group in so far as music made them—at least for a certain time—happier and less tense. Some alcoholic patients showed by their remarks that they felt raised from their present dejected state, "lifted up into a better, higher world", particularly if they were impressed and carried away by the artist's personality. It was obvious that these recitals—performed as they were by artists of outstanding ability—could not fail to make at least some patients aware of the power of

beauty and the spiritual values of life. Even the feeling of one or two alcoholic patients, that the music played sometimes made them feel more discontented and frustrated, might be considered to constitute a not unwelcome reaction as it gave the therapist an opening and a chance to get to work with the patient in an endeavour to diminish his sense of failure, foster deeper insight and perhaps help him to discover more constructive ways of overcoming personal difficulties. The envy expressed by another patient of this group, that great musicians were so fortunate as to be able to express their sufferings in a creative way while the ordinary human being had "only the way of escape left to him", threw a significant light upon the readiness of the psychopathic personality to find excuses instead of exerting himself. The remark by a female alcoholic that "music only makes you sad" is interesting and significant too because she admitted her previous tendency to run away from her personal difficulties: having to sit still and to listen to music forced her into greater introspection and brought her to the verge of tears—"music has made me cry" as she complained. This she agreed afterwards was better than to go on deceiving herself.

There was also, in this group, an interesting example of a strong reaction to music, illustrating the power of music to stir up deeper-seated unconscious motives, usually repressed, and in this way eliciting material for an individual therapeutic approach after the end of the musical session. A patient who previously had never displayed or admitted aggressive tendencies felt very disturbed after listening to Beethoven's "Appassionata", complaining that he could not tolerate music like this: it aroused in him excessive aggressive feelings (such as the wish to murder someone). Later he stated that having brought his repressed aggression into the open and having had it interpreted by the doctor afterwards, he then felt much better and more confident of coping with the effects on himself of his aggressive tendencies, the existence of which in himself he had previously never been aware.

The patient mentioned above, who complained of unpleasant sadness feelings when listening to music irrespective of the musical style, has now been helped also to deal with her tendency to evade issues, and if there would have been an opportunity for more intensive individual treatment, deeper-seated motives for her sadness reaction might have come to the surface. What appears to be of importance is that both sadness and aggression were discovered—solely through the influence of music—below the superficial defenses and escape attitudes.

2. Regarding the effect of the musical recitals upon the second group investigated in this research project, the *Neurosis Unit*, here too the group could be divided into the two sections previously mentioned, and those patients who had more interest in music and more musical understanding were more attracted by the recitals. On the whole, there was a less lively discussion following the recital in the neurotic as compared to the alcoholic group. It was not surprising, however, that in the alcoholic group there were less inhibition and more readiness to talk—as could be foreseen with this type of patient—while in the neurosis unit there was, particularly during the first sessions, a definite reluctance to reveal any reaction. This is perhaps in accordance with the general neurotic tendency to erect and to maintain defenses. Another point perhaps also of influence in this connection is the fact that the musical recitals in the neurosis unit followed shortly after an ordinary group psychotherapy meeting. These patients seemed sometimes still preoccupied with the subject and the happenings at the preceding group discussion, and appeared too distracted to listen to the music. Certainly the response seemed to depend greatly on the state of concentration and the grade of receptivity on the side of the patients, and this state varied according to what had happened in the group shortly before the recital.

How disturbing the influence of music can be and how deeper-seated motives can be stirred up, can be illustrated again by the example of a member of the neurotic group too. A patient listening to a Spanish tango by Albeniz suddenly jumped up and ran away in great excitement. Breaking into tears when questioned later she maintained that this piece of music was the source of very painful associations connected with her deceased

sister who loved dancing. There was, however, a strong suspicion that this explanation was intended to cover up a more likely cause of her reaction, namely the breaking down of the defenses of her strongly repressed sensuality; this abreactory reaction seemed to be accompanied by a beneficial release of tension. A reaction such as this seems to be a good illustration of what music can sometimes achieve and seems to be preferable to one of indifference.

II

In speaking about the recitals in general it seems necessary to emphasize how essential the artist's personality is if one wants to achieve a maximum of influence on a group of patients through music. What seems to matter most is the artist's warm, human personality which seems to be more important in this respect than artistic perfection. It was the unanimous opinion of the patients—independent of whether they were more or less responsive or appreciative of the type of music played—that the experiencing of music played by artists with the "right" personality capable of establishing close contact with the patients was superior to impersonal phonograph recitals. Undoubtedly the maximum effect was observed when an artist with a good, human personality happened to be available several times in succession so that a close, warm, personal relationship had time to develop.

Regarding the choice of program, some observations might be worth while mentioning. There was on the whole a tendency to ask for more popular, familiar music, and the necessity or advisability (at least for a research experiment) to choose music that was not merely entertainment was not fully understood or accepted. Accordingly in later recitals a program mixing serious and lighter musical items was presented. To enable a musical therapeutic approach to reach patients, it is probably advisable to choose the music in such a way that it can be understood by the group as a whole; otherwise some group members will feel bored and "left out", and their irritation might disturb the whole group. A mixed program of more familiar, classical, romantic and traditional music proved preferable, for example, to a mainly classical or romantic program. It appears, furthermore, that it is a mistake to ask for too long sustained attention. One single movement of a sonata seemed to be more than enough; several short pieces, possibly in alternating mood and rhythm, seemed to be the most effective choice.

Conclusions

The lessons learned from the present experiment seem to be mainly:

1. To get the maximum effect from music in a group of patients, one should choose patients on the basis of common musical interest and not of a common psychiatric diagnosis.

2. The musical items presented should be, as far as possible, within musical "reach" of the patients.

3. The artist's personality is of major importance in "contacting" patients. The artist should have a warm, outgoing personality with the capacity for forming strong emotional bonds with the patients. Preferably the same artist should be chosen for several successive recitals.

We would like to express our thanks to the British Council for Music in Hospitals for making this study possible, and to Dr. T. P. Rees, Physician Superintendent of Warlingham Park Hospital, for his encouragement.

BIBLIOGRAPHY

1. Glatt, M. M.: Treatment centre for alcoholics in a mental hospital. *Lancet, 1:* 1318–1320, 1955.
2. Martin, D. V., Glatt, M. M., and Weeks, K. F.: An experimental unit for the community treatment of neurosis. *J. Ment. Sc., 100:* 983–989, 1954.
3. Mitchell, S. D., and Zanker, A.: Musical styles and mental disorders. *Occupat. Ther. and Rehabil., 28:* 411–422, 1949.

Warlingham Park Hospital
Surrey, England

SOCIETY PROCEEDINGS

NEW YORK NEUROLOGICAL SOCIETY AND NEW YORK ACADEMY OF MEDICINE, SECTION ON NEUROLOGY AND PSYCHIATRY

Joint Meeting, March 13, 1956

George H. Hyslop, M.D., President, New York Neurological Society, presiding.

A Familial Form of Neuropathy (Charcot-Marie-Tooth) with Gastro-Intestinal Symptomatology. Dr. Murray E. Margulies and Dr. Iris F. Norstrand.

In this report a family of Greek extraction was studied in whom three generations were afflicted with a degenerative disease of the nervous system akin to Charcot-Marie-Tooth type of peroneal muscular atrophy. The maternal grandfather of this family is reported to have died in the third decade with a widespread muscular atrophy and diarrhea over a period of many years. His daughter, who also had muscular atrophy with weakness and numbness of the legs, and diarrhea, died at the age of 37. Her husband died at the age of 69 of pneumonia. Five of their seven offspring developed in early adult life muscular atrophy, with weakness of the extremities and sensory symptoms. Four of the children had recurrent distressing attacks of diarrhea. The fifth sibling did not have diarrhea, but from early boyhood was subject to nausea and vomiting.

The neurologic picture in all seemingly affected the spinal cord, nerve roots, and peripheral nerves. In two of them the diagnosis of Charcot-Marie-Tooth type of neuritic muscular atrophy was entertained. In another instance the diagnosis of hypertrophic interstitial neuritis of Dejerine and Sottas was made, but not confirmed by biopsy. Laminectomy in the fourth case revealed central gliosis in the cervical segments, though there was undoubted evidence of peripheral nerve involvement in this case clinically. Postmortem examination of the fifth case disclosed degenerative changes in the ventral horn cells of the spinal cord, but limited autopsy studies revealed nerve root disease as the only corroboration of the peripheral nerve symptomatology present during life. No basis for the gastro-intestinal symptoms could be ascertained. It seems justified to postulate that in this family with a widespread disorder of lower motor neuron, sensory and spinal cord function, that there is also present a similar disturbance involving the autonomic nervous system.

Dystonic Amyotrophy. Dr. Israel S. Freiman and Dr. Joachim Luwisch.

This report concerns two patients, both males, who presented an unusual clinical syndrome characterized by dystonia, generalized muscular atrophy of severe degree, pyramidal tract signs and no mental changes. The first patient is 49 years of age. His trouble began at the age of 30 with involuntary movements which gradually and slowly increased through the years. Later he developed generalized atrophy and weakness. He had pes cavus. His lower limbs were markedly thin up to the lower third of the thighs, giving the appearance of stork legs. Deep reflexes were abolished except for a 1+ right knee jerk. Nevertheless he has bilateral Babinski signs. He was able to get on his feet and to walk with difficulty, but is wheel chair ridden because of severe dystonia which develops when he is on his feet. There is severe weakness in the arms. There were no sensory changes. Recently, within the past few months, he has been found to have palpable greater auricular nerves in the neck and a few small nerves on the dorsum of one hand are thickened and firm. Biopsy of muscle indicated mild changes characteristic of neural muscular atrophy.

The second patient is 48 years of age and his trouble began at the age of 26, also with involuntary movements which gradually and slowly progressed and are now present and severe when on his feet. Later he developed generalized muscular atrophy which is now widespread. This patient has widespread hypertrophy of peripheral nerves which are both visible and palpable in the neck, in the hands and in the feet. He has bilateral pyramidal tract signs. His deep reflexes are overactive. There is loss of vibratory sense in all four limbs, to the iliac crests and to the elbows, and along the vertebral column to the twelfth dorsal vertebra. Position sense is greatly impaired in both lower limbs. Sensation is intact to pin prick. Laboratory findings have been essentially normal, including serology. Biopsy of peripheral nerves and muscle disclosed neural muscular atrophy of moderate degree and mild degeneration of peripheral nerves with considerable hyperplasia of Schwann cells.

In the family histories of these patients there is some evidence pointing to a genetic disorder. The first patient is the product of a consanguineous marriage and a few members of both families have congenital disorders of various kinds. We believe these two patients represent sporadic examples of a heredodegenerative disorder involving the extrapyramidal motor system, pyramidal systems and peripheral nerves.

The paper appeared in full in the February, 1956 issue of *Neurology*.

Discussion

Dr. Abraham M. Rabiner: One could dismiss these two papers as very interesting in that on the one hand, a family group of patients with the Charcot-Marie-Tooth type of neuritic muscular atrophy also had gastro-intestinal symptoms, and the second group were patients who had dystonia musculorum deformans and also generalized muscular atrophy.

Both presentations direct attention to an extremely

important facet of the mechanisms underlying the development of many of these so-called heredo-degenerative diseases. There is an inherent defect in the virility of the structures affected. An exogenous agent may at times be an etiologic factor by adversely affecting such structures. Gowers spoke of this as premature decay. Exogenous agents are not selective in their attack on neural structures. In these groups there is usually involvement of the motor systems as well as impairment of proprioception. We know that these structures all participate as a team in the function of locomotion, and the maintenance of erect posture. The clinical picture results from attack and disintegration of this function and is not an exogenous attack on random structures.

Dr. S. Bernard Wortis: I agree with what Dr. Rabiner said regarding our need to study and know more about the factors concerned in these so-called heredo-degenerative diseases. I am not so sure that these syndromes all represent premature aging causing tissue breakdown, because as you know modern genetics is concerned with genes and the effects of environmental stresses on genes during crucial metabolic periods.

The patients' illnesses fall into a group where the etiology is not known, and I hope we are not going to add any more physician-named syndromes to our already overcrowded list of obscure syndromes.

In the muscular atrophies there are three groups: first, those with absence of involvement of the central nervous system, where the muscles alone are the seat of the disorder. We do not know the metabolic cause of these atrophies. The second group is one in which the etiology is equally obscure, where muscle wasting is secondary to destruction of the motor neurons with nuclear degeneration, and the third group consists of the chronic productive wasting diseases due to involvement of the peripheral nerves, and the cases described tonight showed this very clearly.

We are dealing in this entire group with etiologies that need genetic and metabolic elucidation. There are other related heredo-degenerative diseases, including torticollis, or status dysmyelinatus, or double athetosis or spastic pseudosclerosis, or pigmentary degeneration of the globus pallidus, where our knowledge of what causes death and disease of the tissue of the nervous system and/or the muscular tissue is entirely obscure today. And although in the muscular dystrophies, to use an example, we describe and label several subgroups according to age of onset, presence or absence of pseudohypertrophy, distribution of muscular atrophy, etc., there is really no justification for these various subdivisions since many or all are merely variations in the clinical picture of a single disease process.

Advances in our knowledge in these illnesses awaits more exact biochemical knowledge in the field of genetics.

Follow-Up Studies on Circular Manic-Depressive Reactions Occurring in the Young. Dr. Allison B. Landolt.

Sixty patients between the ages of 15 and 22 initially diagnosed manic-depressive psychosis, circular type, at the New York Hospital-Westchester Division have been followed in an attempt to determine the outcome of their difficulties.

Seventy-five per cent of them had positive family histories of mental instability in antecedents or collaterals and one-third of those studied showed schizoid coloring prior to or during their initial illness. None of these factors appeared to significantly affect the eventual prognosis in a statistically valid manner.

Nine of these individuals later developed overt schizophrenia, all of the catatonic type.

Twenty-seven patients have continued to exhibit typically affective symptomatology and two more have continued to have mood swings for a few years but have had no problems in a decade.

No information could be obtained from five people included in the study and statistically inconclusive data were received on 11. Emotional instability was indicated, but no diagnostic inferences could be drawn.

A most interesting statistic appears to be the apparent absence of suicide in the usually accepted sense among the group studied.

Ten patients must now be considered as completely recovered, and six of these have had no recurrence following their initial hospitalization.

Discussion

Dr. Robert B. McGraw: I think we are indebted to Dr. Landolt for bringing this very old problem again to our attention. It is very much with us. I was astounded about a year ago to have a psychiatrist tell me that he did not believe there was such a clinical entity as manic depressive psychosis and had never seen one. I have seen a great many and they do present all these variations which Dr. Landolt has brought to our attention, and it brings again to our minds the question as to whether we should consider these cases as mostly manic depressive, and partly schizophrenic, or mostly schizophrenic and partly manic depressive, and therefore whether we do have these combinations of these two types of illness. I think a further important thing which Dr. Landolt has pointed out is the lack of suicide in this rather large group. To focus on the future, I would hope that studies will be made where cases of manic depressive psychosis without admixture of the schizophrenic type of reaction would be more carefully studied, both from the clinical standpoint and from the biological and physiological standpoints. This was not mentioned in this study and was not included, but I would like to take this opportunity to suggest that such studies be made.

Dr. S. Bernard Wortis: I would like to ask Dr. Landolt, since his group was studied between 1930 and 1949, and partly antedated in this country the intensive use of convulsive electroshock and insulin therapy, whether there was any difference in the recovery rate and the type of recovery using different therapeutic methods.

I would like to support his statement that we are seeing in psychiatric hospitals much less manic depressive psychosis. I do not know why, but our rates at Bellevue have been cut down about 40 per cent. This may be due to the newer therapeutic methods so that the patients are not brought to the hospital. There may, however, be other factors, one being the recent tendency

to use the diagnosis of schizophrenia more frequently than years ago. Would Dr. Landolt please comment on these points?

DR. GEORGE H. HYSLOP: In regard to the disappearance nowadays of manic depressive psychosis, I think a lot of this is a matter of semantics and that certain schools of clinical psychiatry will seize upon a fractional part of a clinical picture and give a title to it which perhaps does not belong.

DR. ALLISON B. LANDOLT: In answer to Dr. Wortis's question, most of these patients actually were in the hospital in the 1930s, when we did not use electroconvulsive or insulin therapy. I had a great deal of difficulty finding manic depressives from 1945 on. Most of these patients have a follow-up from 15 to 25 years. For the few who had electroshock therapy there did not seem to be any specific statistical validity as to the final outcome. They continued to have mood swings. It did not appear to alter the essential course. I cannot answer why there are fewer manic depressives, except as Dr. Hyslop suggests,—a question of semantics. Today frequently the slightest sign of schizophrenic coloring will be diagnosed schizophrenia, regardless of whether the patient has a mood-swing or not, and that may account for more schizophrenic diagnoses than manic depressive diagnoses. We seem to be more interested in schizophrenia.

DR. JOACHIM LUWISCH: I wonder whether the answer may be found in the fact that these manic depressives are seen first as depressions, then they are treated with shock treatment, and they do not enter the manic phase, and whether this could explain the fact that we see fewer manic depressive cases.

DR. GEORGE H. HYSLOP: Dr. McGraw, you see a lot of cases treated with shock therapy; do you think there are fewer manic depressives now?

DR. ROBERT B. MCGRAW: As to whether there is less or more now than there was, I would hesitate to draw a conclusion. As to whether the treatment prevents, or stops, in any great percentage of cases a further attack, I think I will have to say I do not think it does, though we know of many cases where we have treated the patient quite a long time ago with electroshock treatment and they have had no more attacks, but we also have seen cases, as Dr. Landolt has shown, where there was no electroshock treatment given, and where one attack has been the only attack.

DR. HYSLOP: Dr. McGraw, the question of Dr. Luwisch was as to whether shock treatment for a depression prevented a manic phase swing of so-called circular type.

DR. MCGRAW: I think there may be some truth in it, and that is about as far as I can go in answering that question.

ILLNESS, ATTITUDES AND BEHAVIOR PATTERNS IN A GROUP OF "HEALTHY" CHINESE. DR. FRANCIS D. KANE, DR. PETER RICHTER, DR. LAWRENCE E. HINKLE, JR., AND DR. HAROLD G. WOLFF.

This is one of a series of studies to determine which features of man's relationship to his environment are pertinent to his health.

One hundred Chinese were studied as representing a relatively homogeneous group of ostensibly healthy people and who had undergone dislocation from their culture, social life, close interpersonal relationships and geographical location. They were mostly students and professional people who had been in this country five to ten years. The study was made by anthropologists, sociologists, psychologists, internists and psychiatrists.

The findings were that 25 per cent of the group had 53 per cent of illness episodes. Illness episodes cluster. Clusters are typified by involvement of all body systems and all etiologies and major and minor illnesses. Clustering is not predictable on the basis of change per se; clustering is predictable on the basis of informants' own statements of life situation being stressful. These findings are comparable to American groups.

Psychopathology is comparable to that found in American culture. There is a correlation between (1) an individual's sense of continuity about his life and his health and (2) statements of discontinuity and illness. These statements were made independently of descriptions of illness episodes or dislocations.

MASSACHUSETTS SOCIETY FOR RESEARCH IN PSYCHIATRY

Meeting of March 9, 1956

Daniel H. Funkenstein, M.D., President, Presiding

1. PSYCHOLOGIC OBSERVATIONS ON WOMEN RECOVERING FROM MAJOR SURGERY. DORIS MENZER-BENARON, M.D., PHILIP H. GATES, M.D., HARRIET S. ROBEY, M.A., M.S., AND SOMMERS H. STURGES, M.D.

Patients recovering from hysterectomy were studied psychologically and physiologically. Three clinical types were noted. The pattern of behavior in recovering from anaesthesia was found to correspond to the type of convalescence in the hospital. In most patients there was also a correlation between physical symptoms and emotional suffering, both in intensity and in duration.

The paper was discussed by Elizabeth R. Zetzel, M.D.

2. THE HEMODYNAMICS OF THE MECHOLYL TEST AND ITS RELATION TO THE EXCRETION OF EPINEPHRINE AND NOREPINEPHRINE IN NORMAL AND SCHIZOPHRENIC SUBJECTS. FRED ELMADJIAN, PH.D., JUSTIN M. HOPE, M.D., AND HARRY FREEMAN, M.D.

Normal and schizophrenic subjects were studied with respect to the blood pressure and pulse and the excretion of E and NE before and after the administra-

tion of the Mecholyl Test as described by Funkenstein et al. Using excretion data obtained during infusion experiments, estimates of the secretion of E and NE were presented. The results indicate 1.) In normal subjects the resting systolic pressure is related to NE excretion rather than to E, 2.) Elevated blood pressure is evident in few schizophrenic subjects without increased E and/or NE excretion, 3.) "Area" as determined in mecholyl tests is inversely related to NE excretion, 4.) For a level of NE excretion, the chronic schizophrenics show a greater "area" in the mecholyl test than normals or acute schizophrenics. The role of E excretion in the test was discussed.

The paper was discussed by Daniel H. Funkenstein, M.D.

3. Psychotherapeutic Investigation of Imprisoned Public Offenders. Leon N. Shapiro, M.D., and Donald H. Russell, M.D.

In twenty-six prisoners seen in intensive psychotherapy at the Concord Reformatory, Massachusetts the following therapy pattern was observed: 1.) Early emergence of primitive incestuous wishes, 2.) Connection with the criminal act, 3.) Increase in anxiety, 4.) Intense hostility toward the therapist, and 5.) Flight from treatment.

One case (a 20 yr. old rapist) was presented in detail. Failures in the standard therapeutic maneuvers were pointed out followed by a discussion of possible modifications in technique aimed at getting a higher proportion of these poorly motivated people into a meaningful treatment relationship. Emphasis was placed on 1.) The need for the therapist to differentiate himself as clearly as possible from previous authoritarian figures, and 2.) the necessity of avoiding "dynamic" content until a relationship could be established which would support the material.

The paper was discussed by Every D. Weisman, M.D.

BOOK NOTES AND REVIEWS

Books received are acknowledged and given a brief description in this section. Selections serving a variety of interests will be made from these for a more extensive review, as far as space will allow.

BOOK NOTES

Kolle, Kurt (Ed.): GROSSE NERVENARTZE. [Stuttgart: Georg Thieme Verlag, Pp. 284, Illustrated, 1956, D.M. 29.40.]

This book is composed of 21 biographical sketches of famous contributors to the field of neuropsychiatry prepared by 18 authors, each of whom has treated his subject with a knowledge of the person, his interests, career and accomplishments.

The scientists selected were Berger, Bleuler, Bonhoeffer, Cajal, Charcot, Cushing, Erb, Foerster, Freud, Griesinger, Von Gudden, Hughlings Jackson, Jaspers, Jung, Kraepelin, Moniz, Pawlow, Pinel, Konrad Rieger, Sherrington and Wagner Von Janregg with excellent portraits of each. When the book was prepared only three of the subjects were living, namely Jung, Jaspers and Moniz, and since then Egas Moniz the originator of clinical arteriography and lobotomy has passed away.

There is a very valuable appendix which lists the incumbents of the academic and research positions held in psychiatry, neurology, neuropathology and neurosurgery in the German speaking universities and clinics. This list shows the years of academic service and the span of life of all incumbents of the principal positions.

These biographical sketches are very comprehensive and well done. They present an informative view of certain sections of the history of medicine. This book on the shelf of the neuropsychiatrist together with "The Founders of Neurology" edited by Webb Haymaker and published by Charles C Thomas in 1953 will constitute a valuable source of historical information.

Modell, Walter: THE RELIEF OF SYMPTOMS. [Philadelphia and London: W. B. Saunders Co., Pp. 450, 1955, $8.00.]

This is a clear, orderly presentation of topics of great, practical importance, with a unique emphasis and concentration on the problem of relieving the patient's distress as such.

The text consists of three parts. The first contains five introductory chapters presenting "An Argument for the Relief of Symptoms", "The Nature of Relief", "The Complaint", "Placebo Action of Drugs" and "The Trial with the Drug". Part II contains twenty-four chapters, each dealing with a symptom, namely, pain, anxiety, insomnia, gas, constipation, diarrhea, loss of appetite, obesity, palpitation, edema, dyspnea, cough, fever, weakness and fatigue, nausea and vomiting, vertigo, itch, hiccups, unconsciousness, convulsions, skeletal muscle spasm, menstrual disorders, pregnancy and dysuria, and jaundice.

Each symptom mentioned above is considered as to cause, composition and therapy. The author explains that "the list of twenty-four symptoms is not exhaustive, but it includes well over 95% of those which bring patients to the doctor's office. There is, however, considerable overlap; the symptoms themselves are not entirely distinct and separate from each other; and when they are, there are frequent connections between them in physiologic, pathologic and causative mechanisms. The facts introduce a problem of repetition which could be avoided only by continuous cross reference".

Part III is composed of a chapter entitled "Cortisone and the Masking of Symptoms", in which potentials for harm are outlined. Considering the book as a whole, internists as well as neuropsychiatrists are provided with a practical guide for the relief of the discomforts encountered in practice. There are plenty of selected references. It is an excellent book for the general practitioner.

Bender, Lauretta: PSYCHOPATHOLOGY OF CHILDREN WITH ORGANIC BRAIN DISORDERS. [Springfield, Ill.: Charles C Thomas, Pp. 151, 23 figures, 1956, $5.00.]

For over twenty years, Paul Schilder, Lauretta Bender and their coworkers studied and treated all forms of psychiatric problems on the children's service in the Psychiatric Division of Bellevue Hospital, New York. Among the numerous publications of their clinical experiences and theoretical concepts the present book is the fourth of a special series of which the first three were entitled (1) Child Psychiatric Techniques (1951); (2) Aggression, Hostility and Anxiety in Children (1953) and (3) A Dynamic Psychopathology of Childhood (1954), all published by Charles C Thomas in excellent format.

This present volume is scientific, well written and loaded with valuable information for all workers in the field of child psychology and psychopathology. It has the facts well organized and presented in terms of a wide variety of established organic brain disorders including congenital conditions, birth injuries and later head injuries, encephalitis and developmental retardations. Personality and intellectual developments, perceptual patterning, body image concepts, motor defects, anxiety reactions, and other neurotic manifestations are treated comprehensively.

There are useful indexes and a bibliography. The author has accomplished a worthful task in affording so much that is new and needed in this specialty.

BOOK REVIEW

Wyrsch, Jakob. ZUR GESCHICHTE UND DEUTUNG DER ENDOGENEN PSYCHOSEN. [Stuttgart: Georg Thieme Verlag, 1956. Pp. iv + 98. $2.85).]

This ten chapter book on the history and explanation of the endogenic psychoses is larger than it appears. Its print is rather small, which permitted the publisher to reduce the number of pages. Wyrsch, professor of psychiatry at the University of Bern in Switzerland, is the author of several monographs and a number of articles characterized by exact, clinical observations and fine logical discrimination of the meaning of concepts. His main interest is schizophrenia and he has made a special effort to describe schizophrenia and other mental disorders from the subjective viewpoint of the suffering patients without neglecting clinical symptoms. In the present monograph Wyrsch traces the history of the endogenic psychoses since Plato and Aristotle to modern times. Medical case descriptions, biographies and other literary sources throughout the ages prove that the mental disorders diagnosed today as schizophrenic and manic depressive psychoses have been known in all countries and at all times. However, they were not identified as disease entities until toward the end of the XIXth century (by Kraepelin). Before then the various degrees and manifestations of the endogenic psychoses either had been considered as separate disorders or (what particularly delayed their recognition as special disease groups) they had been classified together with other, fundamentally very different, psychological phenomena. Through a detailed semantic analysis of the texts Wyrsch frequently proves that the meaning and implications of many statements were logically different from those ascribed to the statements by their authors and the latter's contemporaries. Wyrsch has been able to demonstrate that the history of the concepts of mental diseases actually has been very gradual and consistent if evaluated in terms of really meaningful additions to factual data and to precision of thinking. He illustrates the great degree to which inadequate concepts retained from the past prevented a recognition of the true meaning of well observed facts. For example, the concept of the "incorruptible soul", indivisible and unchangeable, strongly influenced the discussion of the origin of mental disorders even as late as the second half of the past century. Authors had ceased to talk of the "anima incorruptibilis" but they continued to use the concept unwittingly. The implicit concept

that the soul cannot be ill lies at the bottom of many a "proof" that there can be no diseases of the mind but only diseases of the body through which the mind acts thereby creating the wrong impression that the mind itself is ill. Those who preferred a somatogenic explanation of mental disorders clung to the old ideas longer than those who leaned toward a psychogenic explanation.

This book's main purpose is to describe the different ways in which the clinical facts, placed today under the heading of endogenic psychoses, have been misidentified and hidden from intellectual view because of the misapplication of irrelevant ideas which prevented the medical world from discovering what is sense and nonsense in psychotic behavior, what is organogenic and psychogenic, what is related to the patient's organism and what has a bearing on his interhuman relations. Although this monograph is primarily a history of ideas, it is necessarily also, to some degree, a history of clinical symptomatology. Anyone who is serious about the clarification and better understanding of his own ideas, and particularly those concerning schizophrenia, will be interested in studying this contribution. The author has demonstrated how very slowly and gradually—through generations—new and fruitful ideas are developed. The author writes well and reasons carefully.

Z. A. PIOTROWSKI

BOOKS RECEIVED FOR REVIEW

March, 1956

1. ANSBACHER, HEINZ AND ROWENA (Editors). *The Individual Psychology of Alfred Adler*. Basic Books, Inc., New York, N. Y.
2. BENDER, LAURETTA. *Psychopathology of Children with Organic Brain Disorders*. Charles C Thomas, Springfield, Ill.
3. GORMAN, MIKE. *Every Other Bed*. The World Publishing Co., New York, N. Y.
4. LAUGHLIN, HENRY P. *The Neuroses in Clinical Practice*. W. B. Saunders Co., Philadelphia, Pa.
5. MCALPINE, DOUGLAS, COMPSTON, NIGEL D. AND LUMSDEN, CHARLES E. *Multiple Sclerosis*. The Williams & Wilkins Co., Baltimore, Md.
6. OPLER, MARVIN K. *Culture, Psychiatry and Human Values*. Charles C Thomas, Springfield, Ill.
7. PHILLIPSON, HERBERT. *The Object Relations Technique (with Test Cards)*. The Free Press, Glencoe, Ill.
8. POSER, CHARLES M. *The Relationship Between Syringomyelia and Neoplasm*. Charles C Thomas, Springfield, Ill.
9. REA, FREDERICK B. *Alcoholism: Its Psychology and Cure*. Philosophical Library, Inc., New York, N. Y.
10. ROGERS, MARTHA E., LILIENFELD, ABRAHAM M. AND PASAMANICK, BENJAMIN. *Prenatal and Paranatal Factors in the Development of Childhood Behavior Disorders*. The Johns Hopkins University School of Hygiene and Public Health, Baltimore, Md.
11. TROSTDORF, ERICH. *Die Kausalgie*. Georg Thieme Verlag, Stuttgart, Germany.

NOTES AND NEWS

COURSE IN PSYCHIATRIC ADMINISTRATION

A degree course beginning September 1956 in Psychiatric Administration is announced under the auspices of the School of Public Health and Administrative Medicine and the Department of Psychiatry of the Faculty of Medicine of Columbia University.

This course is designed to prepare candidates for administrative posts in mental hospitals, clinics and community mental health programs.

The curriculum time will be divided between the basic courses leading to a Master of Science Degree in administrative medicine in the School of Public Health and Administrative Medicine, specialty courses in the Department of Psychiatry, supervised field observation in a variety of ongoing and forward looking community and institutional programs, and projects to be carried out by the candidates.

The minimum elapsed time in which such a course can be completed is twenty months of which eight are in academic residence divided into four two month quarters. Not more than two quarters are taken consecutively. The preferred curriculum plan is four months in academic residence, twelve months in a supervised administrative residency (or twelve months in a position already occupied by the candidate during which time he carries out a specific project), followed by a final four months in the University. For candidates who occupy posts of responsibility and who cannot be away more than one quarter at a time, special arrangements can be made.

A limited number of applications will be accepted for the course to begin in September 1956. Further details regarding admission requirements, curriculum and tuition may be secured by writing to the Executive Officer, School of Public Health and Administrative Medicine of Columbia University, 600 West 168th Street, New York 32, New York.

SESSIONS OF AMERICAN COLLEGE OF PHYSICIANS

The American College of Physicians held its Thirty-seventh Annual Session at Los Angeles, Calif., April 16–20, 1956, with a gross registration of over 4,500. Dr. Walter L. Palmer, of Chicago, was inducted as President. Other officers elected were: Dr. Richard A. Kern, Philadelphia, Pa., President-Elect; Dr. Chester M. Jones, Boston, Mass., First Vice President; Dr. George H. Anderson, Spokane, Wash., Second Vice President; Dr. Truman G. Schnabel, Sr., Philadelphia, Pa., Third Vice President; Dr. Wallace M. Yater, Washington, D. C., Secretary-General. Dr. William D. Stroud, Philadelphia, Pa., was re-elected Treasurer.

Forthcoming Annual Sessions of The American College of Physicians

1957—38th Annual Session, Boston, Mass., April 8–12.

RICHARD P. STETSON, M.D., F.A.C.P., 203 Commonwealth Ave., Boston 16, Mass., General Chairman.

WALTER L. PALMER, M.D., F.A.C.P., University of Chicago Department of Medicine, Chicago 37, Ill., President.

EDWARD R. LOVELAND, 4200 Pine St., Philadelphia 4, Pa., Executive Secretary and General Manager.

1958—39th Annual Session, Atlantic City, N. J., April 28–May 2.

JAMES F. GLEASON, M.D., F.A.C.P., 7 S. Oxford Ave., Atlantic City, N. J., General Chairman.

THE SIXTH INTERNATIONAL NEUROLOGICAL CONGRESS

The Sixth International Neurological Congress will be held in Brussels, Belgium from July 21st to July 28th, 1957, in connection with the First International Congress of the Neurological Sciences.

The officers of the Congress are: Honorary Presidents: Sir Gordon Holmes, Prof. Georges Guillain, Dr. Andre-Thomas, Prof. Th. Alajouanine and Prof. Antonio Flores, Prof. G. Monrad-Krohn, Dr. Knud Krabbe, Prof. Henry Alsop Riley and Prof. P. Divry.

The active officers of the Congress are: Prof. P. Van Gehuchten, President; Dr. R. A. Ley, First Vice-President; Dr. Ludo van Bogaert, Secretary-General; Dr. J. Radermecker, Assistant Secretary-Gentral; Dr. J. Titeca, Treasurer; Dr. R. A. Ley, Editor of the Transactions.

At the time of the meeting of the Sixth International Neurological Congress in Brussels, the following additional Congresses will be held:

International League Against Epilepsy
First International Congress of Neurological Surgery
Third International Congress of Neuropathology
Fourth International Congress of Electroencephalography and Clinical Neurophysiology
Fifth Symposium Neuroradiologicum

The first day of the First International Congress of the Neurological Sciences, Sunday —July 21st, will be devoted to: (1) registration at the Bureau of the Congress, (2) the official meeting of the International League Against Epilepsy, in the morning, (3) the Plenary Opening Session of the Congress, in the afternoon, and (4) the Formal Reception for all participants of the Congress, in the evening.

Monday and Tuesday (July 22–23) will be devoted to reports and discussions concerning the two main topics common to all disciplines (neurology, neurosurgery, neuropathology, neuroradiology, electroencephalography and clinical neurophysiology): (1) Extrapyramidal Pathology, the program of which will be organized by Prof. R. Garcin, France; and (2) Significance and Interpretation of Modifications of the Conscious State, the program of which will be organized by Prof. Geoffrey Jefferson, Great Britain.

Wednesday morning will be devoted to the main topic of the International Congress of Neurology; namely, Multiple Sclerosis, the program for which will be organized by Dr. H. Houston Merritt, U.S.A.; the afternoon being assigned to the main topic of the Congress of Neuropathology; namely, Pathologic Aspects of Multiple Sclerosis.

Thursday morning will be devoted to the main topic of the Congress of Electroencephalography and Clinical Neurophysiology; the afternoon, to the main topics of the Congress of Neurosurgery associated with the Symposium Neuroradiologicum: (1) Supratentorial Angiomas, and (2) Therapeutic Applications of Hypothermia.

Friday and Saturday will be devoted to miscellaneous communications and minor topics.

On Sunday, July 28th, there will be: (1) separate administrative meetings of the various disciplines; (2) a common administrative meeting of the representatives of the various disciplines in order to decide on the site of the Second International Congress of the Neurological Sciences; and (3) a celebration of the Centenary of Arthur Van Gehuchten's birth to be held in Louvain, Sunday afternoon.

The topics chosen by and the programs arranged for the International Congresses of Neurosurgery, Neuropathology, Electroencephalography and Clinical Neurophysiology. The International League Against Epilepsy, and the Symposium Neuroradiologicum will be chosen by the respective committees in accordance with the criteria decided upon and will be publicized by these various organizations.

The program committees of the associated Congresses will arrange their own detailed programs: the Congress of Neuropathology under the direction of Dr. Ludo van Bogaert; EEG and Clinical Neurophysiology and also the International League Against Epilepsy, under the direction of Dr. J. Radermecker; the Neurosurgical Congress under the direction of Dr. Brihaye (Brussels), and the Symposium Neuroradiologicum under Prof. Melot (Brussels).

All of the associated congresses will organize individual programs representing their several separate interests. The greatest emphasis will be placed upon subjects which will be of interest to all members of the Congress. Sessions for the presentation of miscellaneous communications will be arranged for but are to be restricted in number and they will be,

so far as possible, grouped in appropriate subdivisions. In connection with these miscellaneous sessions devoted to individual communications, each national committee shall pass upon the desirability of admitting proposed contributions to the program and final acceptance of the proposal will be made by action of the executive committee. Each member will be entitled to present only one communication in which his name appears as an author. At least one of the authors of each communication will be obligated to be present at the Congress to present the communication. Any author failing to present his communication before any session of the Congress will not be entitled to participate in future congresses. Titles and summaries (not to exceed 250 words) of communications offered for presentation at the Sixth International Congress of Neurology, must be in the hands of the Secretary of the Committee for the United States: Dr. Pearce Bailey, National Institutes of Health, Bethesda 14, Maryland, before February 1, 1957. No presentation will be placed on the program of the Congress unless the author has registered as a member of the Congress.

The membership of the Congresses shall consist of: Active, Associate and Auxiliary members. The fee for Active membership will be $15.00. Physicians in fields other than those represented by the individual congresses constituting the Congress of the Neurological Sciences, are eligible for Associate membership. The fee for Associate membership will be $10.00. Non-medical persons, such as members of families and others interested in the Congresses, will register as Auxiliary members. The fee for such membership will be $5.00.

Application blanks for any type of membership in the Sixth International Neurological Congress or the Third International Congress of Neuropathology may be obtained by writing to the Secretary of the Committee for the United States: Dr. Pearce Bailey, National Institutes of Health, Bethesda 14, Maryland. Each applicant for Active membership must be a member or present endorsement by some national or recognized local neurological, psychiatric, or neuropathologic organization.

Application blanks for membership in the First International Congress of Neurological Surgery may be obtained from the secretaries of the several neurosurgical societies in the United States. Application blank for membership in the Fourth International Congress of Electroencephalography and Clinical Neurophysiology may be obtained from: Dr. R. G. Bickford, Mayo Clinic, Rochester, Minnesota.

Thomas Cook and Son, Inc., and The American Express Company have been appointed as official travel agencies for the Congresses.

CERTIFIED BY THE AMERICAN BOARD OF PSYCHIATRY AND NEUROLOGY, INC.

Philadelphia, Pennsylvania

APRIL, 1956

PSYCHIATRY

BADGLEY, THEODORE MCBRIDE, Walter Reed Army Hosp., Washington, D. C.

BECKER, ANNE W., Pontiac State Hospital, Pontiac, Michigan.

BECKETT, PETER G. S., 951 East Lafayette, Detroit 7, Michigan.

BENEZRA, E. ELIOT, 4230th USAF Hosp., Barksdale AFB, Louisiana.

BERBLINGER, KLAUS W., University Hospital, Baltimore 1, Maryland.

BIASSEY, EARLE L., 355 Fairfield Avenue, Bridgeport, Connecticut.

BISER, DAVID I., 481 Eighth Avenue, New York 1, New York.

BLACKWELL, MILFORDE, 2500th USAF Hosp., Mitchel AFB, Hempstead, N. Y.

BRAMWELL, D. M., 2500 East Van Buren Street, Phoenix, Arizona.

BRUNT, MANLY Y., JR., 111 North 49th Street, Philadelphia 39, Penna.

BURTON, ANNA MEISTER, 365 West End Avenue, New York 24, New York.

CALL, JUSTIN D., Univ. of Calif. Medical Center, Los Angeles 24, Calif.

CASEY, JAMES P., 250 East 200th Street, Bronx 58, New York.

CLARKE, THOMAS PASCHAL, III, 5000 Montrose Boulevard, Houston 6, Texas.

DAVIS, FREDERICK H., Louisiana State Univ., New Orleans 12, Louisiana.

DENNETT, ROGER H., 2 Navarro Road, East Haven, Connecticut.

DE RIVAS, CARMELA FODERARO, 1724 Sterigere St., Norristown, Penna.

DI FRANCESCO, ARMAND L., 400 Forest Avenue, Buffalo 13, New York.

DOSS, RICHARD HALLOCK, 223 Bosley Avenue, Towson 4, Maryland.

DUHL, LEONARD J., 6016 Avon Drive, Bethesda, Maryland.

DUSHKIN, MILTON A., 225 Sheridan Road, Winnetka, Illinois.

EDWARDS, ROY A., JR., Route 1, Hopkinsville, Kentucky.

ENELOW, MORTON LEONARD, 1430 Tulane Ave., New Orleans 12, Louisiana.

EPSTEIN, LEON J., St. Elizabeths Hospital, Washington, D. C.

FISCH, MAYER, 1133 Park Avenue, New York 28, New York.

FUCHS, MARIA Z., 1 Gracie Square, New York 28, New York.

FURST, JOSEPH BROWN, 590 West End Avenue, New York 24, New York.

GEDDES, DAVID KOFOID, 1205 North Broadway, Santa Ana, California.

GRAY, MELVIN, 912 South Wood Street, Chicago 12, Illinois.

GREAVES, DONALD CRITCHFIELD, 800 N.E. 13th St., Oklahoma City 4, Okla.

GREENBERG, MARVIN, 255 South 17th Street, Philadelphia, Pennsylvania.

HANSEN, BERNARD FREDERICK, Agnew State Hospital, Agnew, California.

HAWKINS, DAVID ROLLO, Univ. of North Carolina, Chapel Hill, North Carolina.

HELLER, MELVIN S., 111 North 49th Street, Philadelphia 39, Penna.

HEROLD, RAYMOND CONRAD, 420 Jasmine Avenue, Corona del mar, California.

HOFFMAN, CARL J., 2901 Cottman Avenue, Philadelphia 49, Pennsylvania.

HOLLANDER, LEONARD, U.S.P.H.S. Hospital, Lexington, Kentucky.

HULL, WILLIAM MERRYMAN, 3231 Burnet Avenue, Cincinnati 29, Ohio.

JACOB, GUNTHER M., 328 East 74th Street, New York 21, New York.

JACOBY, WILLIAM DEVOS, 5651 Corbin Avenue, Tarzana, California.

KALTHOFF, ROBERT J., Cincinnati General Hospital, Cincinnati 29, Ohio.

KATZ, JAY, 333 Cedar Street, New Haven 11, Connecticut.

KING, RICE TAYLOR, 142 West Lanvale Street, Baltimore 17, Maryland.

KINGSLEY, BUELL CHAPIN, 1700 Bainbridge St., Philadelphia 46, Penna.

KLEINBERGER, ELIZABETH, 1060 Park Avenue, New York 28, New York.

KRAFT, IRVIN ALAN, 4727 Press Drive, New Orleans 22, Louisiana.

KRAMER, SELMA, 6801 North Eleventh Street, Philadelphia 26, Penna.

KUSHNER, EDWARD I., 4123 Nebraska Ave., N.W., Washington, D. C.

KYLES, NORMAN BRUCE, Box 26, State Hosp., Goldsboro, North Carolina.

LANDGRAF, CHARLES WILLIAM, JR., Hastings State Hosp., Ingleside, Neb.

LAPINEL, PAUL E., Vet. Adm. Hospital, Lyons, New Jersey.

LEBEAU, WILLIAM EMANUEL, U. S. Naval Hospital, Philadelphia 45, Penna.

LEON, ROBERT LEONARD, 2200 Federal Office Bldg., 911 Walnut Street, Kansas City, Missouri.

LOCKETZ, HAROLD DAVID—1095 Krameria Street, Denver 20, Colorado.

LOEWENSTEIN, GUSTAV, 608 Garden Street, Little Falls, New York.

LOGAN, JOHN BEACH, State Hospital, Harrisburg, Pennsylvania.

LONDON, NATHANIEL JACOB, 333 Cedar Street, New Haven, Connecticut.

LORDI, WILLIAM M., 1942 Langham Road, Columbus 21, Ohio.

LOWINGER, PAUL LUDWIG, 951 East Lafayette, Detroit 7, Michigan.

MACLEOD, JOHN ADAMS, 3231 Burnet Avenue, Cincinnati 29, Ohio.

MALTZ, J. HERBERT, 6500 Irving Park Road, Chicago 34, Illinois.

MASSIE, WALTER ARTHUR, 55 Marion Avenue, Mansfield, Ohio.

MCCLARY, ALLAN ROBERT, 115 East Eager Street, Baltimore, Maryland.

MCCRANIE, E. JAMES, 5323 Harry Hines Boulevard, Dallas 19, Texas.

MERINO, FRANCISCO F., 444 East 57th Street, New York 22, New York.

MILLER, MARVIN FRED, USPHS Hosp., 210 State St., New Orleans, La.

MILSTONE, STANLEY J., Agnews State Hospital, Agnew, California.

MORRISON, SYDNEY BERGEN, Baylor Medical College, Houston, Texas.

MOSS, ALBERT MURRAY, 3650th USAF Hosp., Sampson AFB, Geneva, New York.

NEMETH, JULIUS, 1213 Court Street, Utica 2, New York.

NISSENBAUM, IRVING, 844 Centre Avenue, Reading, Pennsylvania.

NISWANDER, GUY DONALD, 105 Pleasant Street, Concord, New Hampshire.

O'BRIEN, WILLIAM M., Mendocino State Hospital, Talmage, California.

PAINTER, PAUL, 945 Beverly, Kirkwood 22, Missouri.

PANZER, EDWARD I., 105–25 67th Road, Forest Hills 75, New York.

PERMAN, GERALD, 1737 H Street, N.W., Washington 7, D. C.

PERRY, DONALD JACK, 16654 McKeever, Granada Hills, California.

PHILLIPS, WILLIAM A., St. Davids, Pennsylvania.

PLOTSKY, HAROLD, 1100th Hospital, Bolling AFB, Washington, D. C.

POLSKY, MURRAY, 30 Central Park South, New York 19, New York.

POWELSON, KEITH DAVIS, 5732 Babbitt Avenue, Encino, California.

PUGH, PHILIP F. H., 539 Badgerow Building, Sioux City, Iowa.

RADAUSKAS, BRUNO, 38 Maple Drive, Catonsville 28, Maryland.

ROGERS, GEORGE AUGUSTUS, 524 Cooper Street, Camden 2, New Jersey.

RUSHTON, JOHN RANDOLPH, III, U. S. Naval Hosp., Philadelphia 45, Penna.

SCHARF, LOUIS H., 800 E. Indianola Avenue, Youngstown 8, Ohio.

SCHARL, ADELE E., 76 Fenwood Road, Boston 15, Massachusetts.

SCHNEIDER, JACOB, Willard, New York.

SCHURGAST, ANSELM W., Connecticut State Hospital, Middletown, Conn.

SHANDS, HARLEY C., Memorial Hospital, Chapel Hill, North Carolina.

SILVER, MAX ISADORE, 2621 Read Avenue, Belmont, California.

SINGER, RICHARD GEORGE, 17 Clover Lane, Westbury, New York.

SKOLNIK, ZALEC, 874 Merrick Road, Massapequa, New York.

SMARR, ERWIN R., 270 Trent Road, Penn Wynne, Philadelphia 31, Penna.

SMITH, CHARLES BURNETT, 2109 Hayes Street, Nashville 5, Tennessee.

SOMMERNESS, M. DUANE, State Hospital, Fergus Falls, Minnesota.

SPORTSMAN, LENORE M., 213 Ontario Street, Albany 3, New York.

SUPER, WILLIAM CHRISTIAN, 2405 Napoleon Avenue, New Orleans 15, La.

TAYLOR, RICHARD W., Vet. Adm. Hospital, East Orange, New Jersey.

TIFFANY, WILLIAM J., JR., C-19, Fitzsimons Army Hospital, Denver 8, Colorado.

TITCHENER, JAMES LAMPTON, Cincinnati General Hosp., Cincinnati 29, Ohio.

TUMARKIN, BERNARD, 220 Miracle Mile, Coral Gables, Florida.

VAN DER MEER, HERMAN, Darlington Sanitarium, West Chester, Penna.

VANDERPOL, MAURICE, 61 Eaton Road, Needham 92, Massachusetts.

VASS, ILONA, 1091 Madison Avenue, New York 28, New York.

VON TAUBER, OLGA M., P. O. Box 204, Kings Park, L. I., New York.

WEIMER, ROBERT EDWARD, Norman M. Beatty Memorial Hospital, Westville, Indiana.

WEINSTEIN, JACK H., 7834 Penrose Avenue, Elkins Park 17, Penna.

WELSCHER, GEORGE FRANK, Topeka State Hospital, Topeka, Kansas.

NEUROLOGY

AUTH, THOMAS LOUIS, 2650 Wisconsin Ave., N.W., Washington 7, D. C.

BAKER, ROBERT NORTON, 3700th USAF Hosp., Lackland AFB, San Antonio, Texas.

BASTRON, JAMES ARTHUR, Mayo Clinic, Rochester, Minnesota.

EPSTEIN, ARTHUR WILLIAM, 1430 Tulane Avenue, New Orleans, Louisiana.

GAROUTTE, BILL CHARLES, Univ. of Calif. Hosp., San Francisco 22, Calif.

* HARTMAN, ALEXANDER S., Vet. Adm. Center, Wood, Wisconsin.

JOHNS, THOMAS RICHARDS, II, Univ. of Va. Hosp., Charlottesville, Va.

* Denotes Supplementary Certification.

KING, GERALDINE, 133 South 36th Street, Philadelphia 4, Pennsylvania.

LAPHAM, LOWELL W., 3640 Warrensville, Shaker Heights 22, Ohio.

LEVINE, IRVING M., 194 Callender St., Dorchester 24, Massachusetts.

LUTTRELL, CHARLES NELSON, JR., 601 North Broadway, Baltimore 5, Md.

NORSA, LUIGIA, 303 East 27th St., New York 16, New York.

* NORSTRAND, IRIS FLETCHER, 7624 Tenth Ave., Brooklyn 28, New York.

PLUM, FRED, Div. of Neur., Univ. of Wash., Seattle 5, Washington.

SCHMIDT, RICHARD PENROSE, Div. of Neur., Univ. of Wash., Seattle 5, Washington.

SUMMERS, THOMAS B., Dept. of Neur., Univ. Hosps., Iowa City, Iowa.

VA. RESEARCH PROGRAM

Veterans Administration has announced it soon will conduct one of the first large-scale cooperative projects investigating the value and useage of the new tranquilizing drugs for mental illness.

Dr. Jesse F. Casey, director of VA's psychiatry and neurology service in Washington, D. C., said the research is expected to provide the answers to many questions not now available to medical science.

The general outline of the research will follow the internationally known VA-Armed Forces studies of the so-called "wonder drugs" for tuberculosis in which the findings over the last 10 years have been used by medical science throughout the world for the more successful treatment of TB.

The first objective of the tranquilizing drug research, will be to determine the value of the different drugs now in use for the treatment of mental illness and those that may be introduced in the future.

Once the value of each drug has been established, the next step will be to determine the adequate dosage for different types of patients, how long the drug should be administered, and many similar questions. The study will be a carefully planned enterprise in which all participating hospitals will agree in advance on the procedures to be followed. The participating hospitals will join the project voluntarily, with the understanding it will not prevent individual investigators from conducting research projects of their own.

FIRST INTER-AMERICAN CONFERENCE ON OCCUPATIONAL MEDICINE AND TOXICOLOGY

The University of Miami, School of Medicine, jointly with the University of Havana, Cuba, School of Medicine, will hold this year the first inter-American Conference on Occupational Medicine and Toxicology. The meeting will be held September 3 to 7. The official language of the program will be Spanish.

This year the conference will be held in Miami with the University of Miami, School of Medicine serving as host. It is expected that this conference will be repeated next year with the University of Havana serving as host.

The program is in the hands of a committee from these two Universities. General Chairman of this year's meeting is Dr. Homer F. Marsh, Dean of the School of Medicine of the University of Miami. Co-chairmen for the University of Miami include Dr. Ralph Jones Jr., Professor of Medicine, Dr. Willard Machle, Research Associate Professor of Pharmacology, and Dr. William B. Deichmann, Professor of Pharmacology. The committee of the University of Havana includes the following: Dr. Angel Perez André, Acting Dean (Vice Dean), Dr. Rafael Peñalver, Instructor in Legal Medicine and Toxicology, Dr. Vicente Pardo Castelló, Assistant Professor of Dermatology, and Dr. Francisco Lancis y Sanchez, Assistant Professor of Legal Medicine and Toxicology.

The program at this time includes speakers from Venezuela, Mexico, Peru, Colombia, Chile, Puerto Rico, Cuba and the United States.

CONVENTION ON MEDICAL ELECTRONICS

The most advanced electronic theories and products of interest to the Medical and Health Field will be presented at the 1956 Western Electronic Show and Convention in Los Angeles, August 21–24.

The Show, which will be conducted at the Pan Pacific Auditorium, will feature the exhibits of 650 firms from all over the nation. A major part of them will be related to the advancement of the Medical and Health Field. Among these exhibits will be the latest in computers, instrumentation, data reduction and processing equipment and specialized television equipment.

The Convention, which will headquarter at the Ambassador Hotel, will consist of 48 conference sessions, during which some 190 technical papers offering valuable studies of the electronic industry's most advanced thinking will be presented.

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION

The 1956 Conference of the American Occupational Therapy Association will be held from September 29th through October 5th in Minneapolis, Minnesota, at the Nicollet Hotel.

The theme of the Conference will be "Time for Reflection", and the topics will include: Occupational Therapy in relation to General Medicine and Surgery, Geriatrics, Pediatrics, Physical Disabilities, and Psychiatry.

DR. STAINBROOK APPOINTED AT LOS ANGELES

Dr. Edward J. Stainbrook, Professor and Chairman of Psychiatry, State University of New York College of Medicine at Syracuse, has resigned to accept the chairmanship of the new department of Psychiatry at the University of Southern California School of Medicine, Los Angeles, and directorship of the Psychiatric Services at the Los Angeles County Hospital. Dr. Stainbrook has been associated with the Bellevue Hospital, the Payne Whitney Clinic of New York Hospital, New York Psychiatric Institute Columbia University and the Yale University School of Medicine, New Haven. He has been Psychiatric Consultant to the surgeon general of the Army since 1950. Dr. Stainbrook recently returned from a six week tour of the Army's Far East Command. He will assume his new duties in Los Angeles this summer.